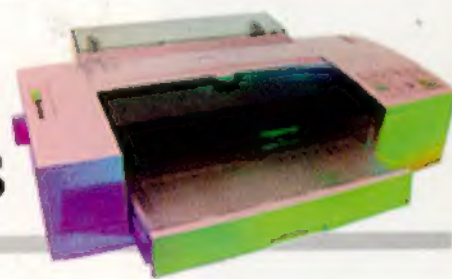




Reduce Your PC Expenses

Our New **Net Tools** Section Shows How

Color Printers 22 Choices
For Office and Pro Graphics



Armchair Architect Eight Powerful
3-D Design Packages for the Home

56K MODEMS

**PC Labs
Tests 19
of the
Fastest
Modems**



www.microsoft.com/ie4/loaded



EQAD[E]D



Where do you want to go today?*

Internet Explorer 4

Microsoft

To get Microsoft Internet Explorer 4: Download it free from the Web or order a CD, for \$4.95, from the Web or at 1-800-485-2048. *Connect-time charges may apply. ©1997 Microsoft Corporation. All rights reserved. Microsoft, FrontPage, Windows, and Where do you want to go today? are registered trademarks and the Microsoft Internet Explorer logo, Active Channel, NetMeeting and Outlook are trademarks of Microsoft Corporation. Java is a trademark of Sun Microsystems, Inc. Other product and company names mentioned may be trademarks of their respective owners.

It does things computers weren't able to do back in 1997.

Introducing NEC Direction™ PCs. The latest in cutting edge technology from NEC.

The new Direction PC from NEC isn't merely ahead of most computers. It's ahead of its time. In fact, it represents the next phase in the PC evolution. Which isn't surprising when you consider that NEC introduced the first color laptop and the first high availability workgroup servers. So call NEC NOW™ and



Why NEC NOW?

- The security of partnering with a company known for its technological innovations.
- The flexibility of ordering direct or through a reseller.
- The expertise of System Consultants.
- The immediate availability of competitively priced products.
- The resources of one of the world's largest computer companies.



talk to a knowledgeable System Consultant who can help you design the Direction system that best suits your needs. We'll even give you the choice of working with a highly qualified NEC reseller partner. See why, in an industry where people



pentium®
PROCESSOR

struggle to stay current, NEC offers a more appealing option. Staying ahead.

NEC monitor with sharp color and high resolution. Available in a 15" (14" v.i.s.) or 17" (16" v.i.s.) screen.



Wavetable audio system provides clearest sound available.

**BUILT
TO
ORDER**

©1997 NEC Computer Systems Division, Packard Bell NEC, Inc. NEC, Versa, and MultiSync are registered trademarks; VersaBay, A700, C700, C500, ESM, PortBar, MiniDock and Express5800 are trademarks, and UltraCare is a service mark of NEC Corporation, all used under license by Packard Bell NEC, Inc. Direction, VersaNote, VersaExec, and MagicEye are trademarks and NEC NOW is a service mark of Packard Bell NEC, Inc. Leasing based on typical 36-month lease with purchase option. Other lease options may be available, leasing arranged by third party leasing company to qualified customers. Prices do not include shipping or applicable sales tax, are valid in the US only and are subject to change without notice. Products and specifications are subject to change without notice. *Product is 56Kbps capable. However, due to FCC rules which restrict power output of the service providers' modems, current download speeds are limited to approximately 53Kbps. Actual speed may vary depending on line conditions. MS, IntelliMouse, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. NetWare and Novell are registered trademarks of Novell, Inc. The Intel Inside logo, LANDesk and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other trademarks and registered trademarks are property of their respective owners.

NEC Direction PCs *A new direction in cutting edge technology.*

Common Features: Mini-Tower or Desktop Tool-Less Chassis • 24X max CD-ROM • 3.5" Floppy Drive • Microsoft® Windows® 95 • MS® Office 97 SBE • 2 USB Ports • Microphone • Palmrest Keyboard and MS IntelliMouse® • 3-Year Limited Warranty with 1-Year On-Site Service • DirecPC Satellite Dishes are Now Available as Upgrades on all Direction Systems

Direction SPT233

- 233MHz Pentium processor with MMX™ technology/512KB L2 Pipeline Burst Cache
- 7.0GB Ultra DMA Hard Drive
- 32MB SDRAM
- Number Nine PCI Revolution 3D, 4MB WRAM
- Altec® ACS-45 Speakers/AWE32 Wavetable Audio
- Iomega® Zip Drive
- U.S. Robotics® 56Kbps* Data/Fax/Voice Modem
- NEC C700™ 17" Monitor (16" viewable/v.i.s.)
- * Upgrade to NEC MultiSync® A700™ 17" Monitor (15.6" v.i.s.), add \$229
- * Upgrade to 64MB SDRAM, add \$199

\$2649

Business Lease: \$95/mo.

Direction SPT233

- 233MHz Pentium processor with MMX technology/512KB L2 Pipeline Burst Cache
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM PCI Graphics Card
- Altec ACS-45 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to NEC C700 17" Monitor (16" v.i.s.), add \$199
- * Upgrade to AWE32 Wavetable Audio, add \$49

\$1949

Business Lease: \$70/mo.

Direction SPL300

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 9.0GB SCSI Hard Drive
- 64MB SDRAM
- Number Nine AGP Revolution 3D, 4MB WRAM
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- Adaptec 2040UW SCSI Controller
- Iomega Zip Drive
- NEC C700 17" Monitor (16" v.i.s.)
- MS Windows NT® 4.0
- * Upgrade to 128MB SDRAM, add \$379
- * Upgrade Video Memory to 8MB WRAM, add \$119

\$4229

Business Lease: \$148/mo.

Direction SPL300

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 7.0GB Ultra DMA Hard Drive
- 64MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Wavetable Audio
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to Number Nine AGP Revolution 3D, 4MB WRAM, add \$219
- * Upgrade to Iomega Zip Drive, add \$99

\$2949

Business Lease: \$106/mo.

Direction SPT233

- 233MHz Pentium processor with MMX technology/512KB L2 Pipeline Burst Cache
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- Number Nine PCI Revolution 3D, 4MB WRAM
- Altec ACS-45 Speakers/AWE32 Wavetable Audio
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to Altec ACS-410 Speakers with ACS-251 Subwoofer, add \$69
- * Optional U.S. Robotics 56Kbps* Data/Fax/Voice Modem, add \$119

\$2379

Business Lease: \$86/mo.

Direction SPT200

- 200MHz Pentium processor with MMX technology/512KB L2 Pipeline Burst Cache
- 3.2GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM PCI Graphics Card
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to NEC C700 17" Monitor (16" v.i.s.), add \$199
- * Upgrade to Iomega Zip Drive, add \$99

\$1789

Business Lease: \$64/mo.

Direction SPL300

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 6.4GB Ultra DMA Hard Drive, 9.5ms
- 64MB SDRAM
- Number Nine AGP Revolution 3D, 8MB WRAM
- Altec ACS-45 Speakers/Wavetable Audio
- U.S. Robotics 56Kbps* Data/Fax/Voice Modem
- Iomega Zip Drive
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to Altec ACS-410 Speakers with ACS-251 Subwoofer, add \$69
- * Upgrade to NEC MultiSync A700 17" Monitor (15.6" v.i.s.), add \$229

\$3499

Business Lease: \$126/mo.

Direction SPL266

- 266MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to Wavetable Audio, add \$49
- * Upgrade to NEC C700 17" Monitor (16" v.i.s.), add \$199

\$2329

Business Lease: \$84/mo.

Video performance is enhanced by 4MB of WRAM.

300MHz Intel® Pentium® II processor (the fastest on the market).

Up to 9GB SCSI hard drive for large capacity storage.

Convertible chassis available as a mini-tower or a desktop.

SDRAM for fast memory access.

Call now for immediate delivery from our factory or for a free catalog.

Mon-Fri 8am-8pm EST Dept. No. PM582A

1-888-8-NEC-NOW

www.necnow.com (1-888-863-2669)

CIRCLE 153 ON READER SERVICE CARD

NEC

Retooling a Net Effort



Networking has been a part of the PC since—well, ever since there's been a PC. In the early days of the PC, when hard disks could cost thousands of dollars, computer networks were a way of sharing expensive peripherals. Later, networks became essential means of sharing files and printers.

Companies began using networks as backbones for all sorts of applications, such as collaborating on documents and spreadsheets or filing expense accounts. Electronic mail became an essential communications tool.

In the past few years, the Internet has gone from a fairly exotic communications medium to a common tool for research, communications, and, most recently, electronic commerce. Networking isn't an option anymore; it's the way business computing works.

As networking has grown in depth and application, the number of people involved in networking has grown as well. Networking is no longer the exclusive province of large companies or of IT departments. Companies both large and small are now putting networks to work in their applications and in their ways of working. Issues such as reliability, manageability, and total network costs now affect more people than ever.

Similarly, networking has been a part of *PC Magazine* since—well, ever since there's been a *PC Magazine*.

From our earliest issues, we've been covering the emergence of networking under the watchful eye of senior networking editor Frank J. Derfler, Jr. Frank, who once managed large computing projects for the U.S. Air Force, started writing about networking for *PC Magazine* more than 15 years ago. Almost a decade ago, he set up PC Magazine LAN Labs, the first publication laboratory designed for testing networking products. Today, we test networking products primarily at the ZD Labs facility, which makes use of not only a wide variety of networking products but also more than 480 clients for putting today's network equipment to the test.

Four years ago, we started an additional section of *PC Magazine* called the Network Edition, which has gone to subscribers who wanted extra networking

coverage. This is what we call a "demographic" edition, in publishing terms. But as networking has moved from being solely the province of experts in IT organizations to being a standard part of computing, more readers have been asking for additional networking coverage.

The result is a new section called Net Tools, which you'll see later in this issue. It's the

successor to the Network Edition, and it starts on page 223.

In Net Tools, you'll see a focus on network infrastructure. This section will be available to all of our readers in every issue. Topics will include integrating computers into networks, running and maintaining intranet and Internet servers, and dealing with issues of network security, management, and reliability.

Networks are no longer just ways of sharing peripherals and connecting people: They are an essential part of managing your complete costs and benefits of computing. For instance, in our first Net Tools feature, we look at management software that can reduce your total cost of ownership of desktop PCs.

As usual, we'll focus on labs-based comparative reviews. On the editorial side, Frank Derfler continues to lead our efforts in this area, aided by senior editor Leon Erlanger, associate editor Sarah L. Roberts, and a team of staff editors, researchers, and contributors. On the labs side, our effort is headed by a team at ZD Labs under the direction of West Coast Labs director Steve Buehler and project leader Robert Norton.

As networking has grown from the concern of a few to an interest of many, our coverage has had to change as well. Of course, we'll continue to cover networking applications in the features section of the magazine. We know that networking isn't an option in personal computing anymore. Rather, networking is the heart of many PC applications.

A stylized, handwritten signature of Michael J. Miller in black ink.

MICHAEL J. MILLER



We love PC servers,
but we're always careful not to swallow 'em after they come out of the cereal box.

To start your day with something a little stronger, we suggest the Sun Enterprise 450 Workgroup Server.

Actually, PC servers aren't all that bad, given what they do. But their role in the workgroup is changing, and your users are asking for more than print and file services. They want to leverage Internet, intranet, and Java™ technologies, and run mission-critical applications. Which means you need a more robust server. You need the Sun™ Enterprise 450 running on Solaris™, with its superior reliability, scalability, availability, and security. The Enterprise 450 works transparently with all Microsoft Windows and Novell desktops. In addition, Sun supports the Enterprise 450 and many enterprise-class applications with worldwide customer service. As for performance, the Enterprise 450 makes the average PC box (like a Compaq ProLiant) look – well, pretty

average, with 42% better SPECint95, and 30% better OLTP. As for throughput, it's better by 150% on internal disk, 230% on memory access, and 275% on PCI I/O. All for a price that should be a pleasant surprise, though it may have a different effect on our PC friends. For more, check us out on the Web at

www.sun.com/wgspm **THE NETWORK IS THE COMPUTER™**

	SUN SERVER	PC SERVER
SCALABILITY	A	F
RELIABILITY	A+	C
AVAILABILITY	B+	F
MANAGEABILITY	A	D
INTEROPERABILITY	B	B-

All grades tabulated by the Standish Group 1997 Study, comparing Sun's Solaris 2.6 and Microsoft Windows NT 4.0 operating systems.



COVER STORY

Fast Connections
For All?

BY LES FREED

Really fast modems at pretty good prices that you use over ordinary phone lines. Well, almost. Here's how the new 56K modems fare in our testing.....100

Best Data MACH 2 56K Data/Fax Modem.....105	E-Tech Cyber Bullet PC56 RVP.....113	Motorola ModemSurfr 56K Data/Fax Modem.....115	Editors' Choice.....104
Boca 56K Internet Modem.....105	Global Village TelePort 56 fax/modem.....113	Practical 56K Data/Fax K56flex.....120	How 56K Modems Work.....105
Cardinal Connecta Internal 56K Data/Fax Modem.....105	Hayes Accura 56K Fax Modem.....114	3Com Sportster 56K Faxmodem.....120	56K Modems to Go.....108
Diamond SupraExpress 56e, 56i Sp.....113	Logicode Quicktel 56W95-P.....114	3Com Courier V/Everything.....120	Does Your ISP Offer 56K?.....113
		Zoom/FaxModem 56K, 56Kx.....120	Summary of Features.....114
			Performance Tests.....118

NET TOOLS

TKO Your TCO Today

BY FRANK J. DERFLER, JR.

"Total cost of ownership" is on everybody's mind and seems to be a Rorschach test for the PC market: To each network manager, it appears as something different. Much of the talk about lowering TCO focuses on a future with so-called thin clients, mega-servers, and some kind of intermediary software. But what can network managers do about lowering costs today? In our new Net Tools section, we review strategic products from four vendors that propose to lower the cost of PC desktops now.....223

LANDesk Configuration Manager.....228
LabExpert 2.0.2.....235
ON Command Comprehensive Client Manager.....239
Microsoft Systems Management Server 1.2, Zero Administration Kit.....241

ALSO IN THIS SECTION:

From the Bench.....245
Voice Across the Internet: Vienna way.....245
Micom V/IP Voice Gateway.....248
Finding the Security Holes: RealSecure 1.0 for Windows NT 4.0.....250
Cross Talk.....250
Multiple Access.....246
Internet Tools: Drill a VPN Through the Internet.....253

WWW.PCMAG.COM

Net Tools Debuts Online

PC Magazine is expanding its networking coverage, and PC Magazine online is on the job, too. Stop by at Net Tools online to keep up to date on the newest networking technologies. Also online: Make your next printer buying decision with the help of our summaries of printer features; check out our expanded coverage of 56K modems.

From the Editor-in-Chief.....4
Pipeline.....9
Letters.....21
Trends.....28
► The great Java rift
► Law enforcement cracks down on Internet capers
► Inside PC Labs
► Internet 2 promises an ultra-high-speed network

UP FRONT

First Looks.....45	Second Looks.....80
► Travel aid from your PC: Four trip-planning packages	► U.S. Robotics' PalmPilot: A better desktop
► Epson PowerLite 7000	► Netscape Communicator: 4.02 and counting
► Lightweight notebooks	



COLUMNISTS

JAKE KIRCHNER.....30
BILL MACHRONE.....89
JOHN C. DVORAK.....91
INSIDE TRACK.....93
JIM SEYMOUR.....97
BILL HOWARD.....99



LASER PRINTERS

Clean, Crisp, & Color!

BY M. DAVID STONE

Given the choice, most users prefer color printing to mere black and white any day of the week. That's not just for the fun of it, either. Color conveys information in ways black and white cannot. With this crop of color laser-class printers, color has become a reasonably affordable choice for workgroups.....123

HP Color LaserJet 5M	125	Editors' Choice	128
Lexmark Optra SC 1275n	128	Color Output Comparisons:	
Mimolta Color PageWorks	132	Some Good, Some Better	132
Tektronix Phaser 350	136	Performance Tests:	
Tektronix Phaser 560	136	Color Laser Printers	134
Xerox DocuPrint C55mp	143	Approximating True Colors	
Choose the Printer That		with Dithering	136
Suits Your Needs	124	Summary of Features	138

GRAPHICS PRINTERS

Color for the Pros

BY M. DAVID STONE

If you're a graphics professional whose livelihood depends on color artwork, this is the roundup for you. If you're someone who needs the same capabilities but only occasionally, this is also the roundup for you. We review 15 units that span five color printing technologies, one of which should suit your needs and purse strings.....145

Alps MD-2300	162	SpectraStar DSx	173
Canon BJC-4550	162	Tektronix Phaser 300X, 380, 450, 480X	178
Eastman Kodak DS 8650 PS	164	Editors' Choice	148
Epson Stylus Color 1520, 3000	164	Color Output Comparisons	157
Fargo Pictura 310e	166	Variable-Dot: A Lifeline for Thermal Wax?	162
HP DeskJet 1000Cse	170	Performance Tests	170
QMS ColorScript 480	172	Summary of Features	172
Tally T7070, SpectraStar 280,			

AFTER HOURS

Dream Designs

CustomHome 3D	353
DecoTech Designer 5	353
Expert Home Designer 3D	356
FloorPlan 3D Deluxe	356
myHouse for Windows 3.0	356
Planix Home Design	
Suite 3D	360
3DHome Architect Deluxe	360
Visual Home Deluxe	365

Building your future dream house or remodeling your current one is sure to involve plenty of complications along the way; you don't need to have your PC-based 3-D design software making things even tougher for you. We review eight home design products, looking for a package that provides you with powerful features behind an easy-to-use, flexible interface353

PCs
**Servers.
Cheap.**

BY STEVE RIGNEY

No more buying way too much server for your needs! We review nine intermediate server systems that deliver good performance and management capabilities at attractive prices.....181

Acer America Corp.	189
Advanced Logic Research Inc.	200
AST Computer	205
Compaq Computer Corp.	208
Dell Computer Corp.	212
Digital Equipment Corp.	212
Micron Electronics Inc.	217
S.A.G. Electronics Inc.	219
"PC Labs Home-Brewed Special"	220
Suitability to Task	182
Editors' Choice	183
Sensible Storage Management	184
Price/Performance Index	189
Performance Tests	192
Hewlett-Packard's Promising New NetServer E 45	200
Summary of Features	204

PC TECH

C++ Code Profilers	257
Detect inefficient code in Visual C++ programs.	
Tutor	267
Varieties of RAM.	
Power Programming	271
Building automation hierarchies with MFC, Part 2.	
Utilities	281
Make telephone numbers easier to remember.	

PC SOLUTIONS

User-to-User	287
Filename completion in NT 4.	
Ask Our Advisors	304
► Hardware: Is the Web eating up your hard disk?	
► Operating Environments: Windows start-up problems	
► Word Processing: Toggling the FileOpen menu	
► Spreadsheets: Finding the highest values in a range	
► Databases: A query Autonom	

AFTER WORDS

Abort, Retry, Fail?	384
ALSO IN THIS ISSUE	
PC Magazine Marketplace	323
Premier	324
Classified	338
BusinessCard	350
Reader Service Card	371
Advertisers' Index: Companies	377
Advertisers' Index: Products	379
Coming Up	381
Editorial Product Index	381

PC MAGAZINE EXTRA

On CD • Fall 1997

- Guided tours of Windows 98
- Multimedia reviews of the top 100 CDs
- Interactive benchmark test results
- Customizable performance viewers
- Back-issue database



To order, call 800-335-1195 in the U.S. or 303-665-8930 elsewhere.

SIX KEY REASONS TO MAKE YOUR PAPER FORMS ELECTRONIC.

1

INSTANT FORMS:

Scan in existing forms for easy conversion, pick pre-built form components from a scrapbook or create custom forms using powerful design tools.

2

EASY TO FILL OUT:

Filling out electronic forms is easy. Just tab and type. Enter data quickly from a list of drop down choices.

3

DATABASE INTEGRATION:

Automatically builds a database for each form. Search and sort records. Supports popular database formats like Access, dBASE, Paradox and others. Supports OLE 2.0.

4

SPELL CHECKING:

Electronic forms give you perfect results by spell checking your forms automatically. Plus you can print, fax or e-mail your forms to others.

5

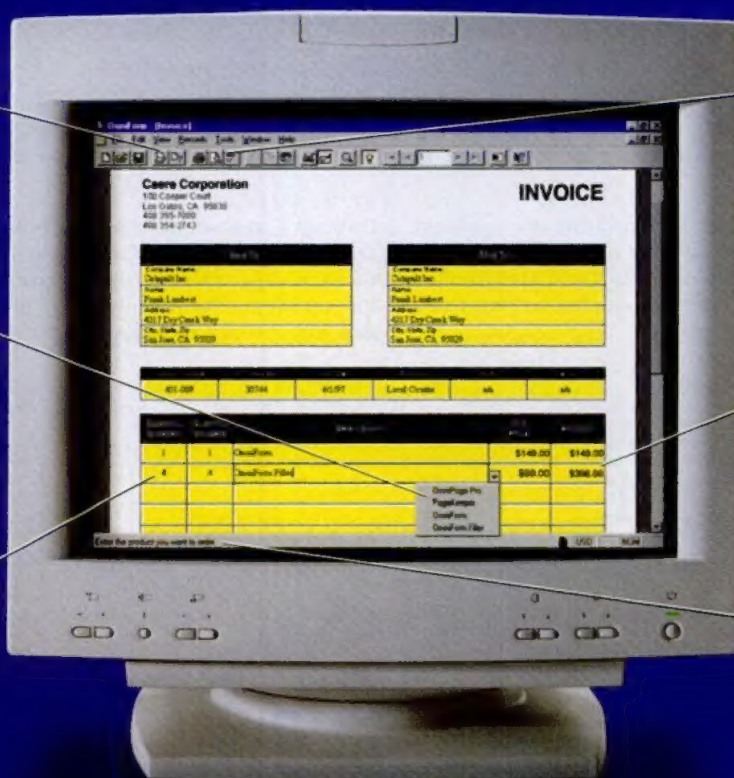
BUILT-IN CALCULATIONS:

Electronic forms can create calculations automatically or just drag and drop using over 35 Excel-like calculations.

6

HELP:

If you're not sure what to put in a particular field, don't worry. Each field can have a help message that will assist you in filling out the form.



OmniForm® GIVES YOU EXACT ELECTRONIC DUPLICATES OF YOUR PAPER FORMS IN SECONDS.

Don't put up with paper forms any longer. Using Caere's proven, award-winning OmniPage® OCR technology, OmniForm® lets you scan and convert existing paper forms into electronic forms in seconds. The result? Total electronic duplicates you can see on your computer screen, edit, fill out and even spell check. To enter or change data, you just tab and type. It's that easy!

With OmniForm, you can print and fax your forms, or e-mail them throughout your company. And it gives you a simple, but

powerful tool set to edit your forms, change fonts, add graphics or design completely new forms from scratch.

OmniForm also performs automatic calculations, validates entries and creates databases. So the information you get from your forms works a lot harder for you, not the other way around.

Want to add users? OmniForm

Filler lets even more people use your electronic forms for a small additional cost.

Why deal with paper when you can save so much time and hassle using OmniForm? Call or visit a reseller for your copy today.



www.caere.com



Now only **\$149***

800-654-1187
extension 200



Available for Windows 95, Windows 3.11, Windows NT and Macintosh

*Suggested price US dollars—subject to change without notice. Offer valid in US and Canada only. Caere, the Caere logo, OmniPage and OmniForm are registered trademarks of Caere Corporation. All other names are the property of their respective holders. © 1997.

CIRCLE 292 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

Pipeline



Sun Eyes Consumers

Only weeks after announcing its acquisition of Web appliance developer Diba, Sun Microsystems started moving quickly to make new consumer information appliances a reality.

Sun recently announced its Web appliance strategy, which calls for "open standards-based" hardware reference designs for a range of new platforms, including Internet phones, smart cards, set-top boxes for Web access on TVs, and a variety of information appliances.

The idea is to enlist manufacturers to build new Java-smart devices based on the reference designs and to participate in development with Diba, Sun's information appliances division. "Sun's reference designs offer manufacturers integrated hardware/software solutions based on open standards," says Chet Silvestri, president of Sun's microelectronics division. "For example, our consumer designs will run on a variety of microprocessors and real-time operating systems and support any Internet service provider and any Web-based content."

Diba is known for its set-top boxes and accompanying software, but it also has designs and software plans for many other appliances, such as browser-based terminals for kitchens and Internet yellow-pages devices for office hallways.

Over 140 content providers, among them *USA Today's* online version and CBS SportsLine, have pledged to supply content for Diba's customized appliances. And 25 Internet service providers—including MCI and Sprint—will provide connections. Diba's Content Program provides HTML development guidelines and certification services to Web sites that want to target content at Diba's information appliances.

The Instant Web Office

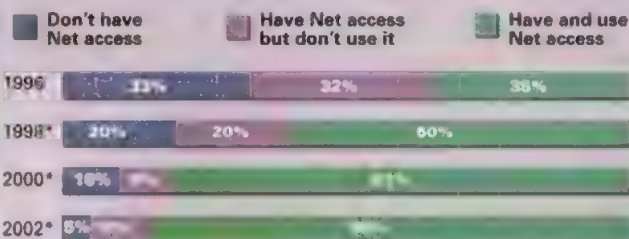
Have a small office that needs an intranet? Netscape's new Netcenter builds on-the-fly intranets at its Web site, in exchange for a credit card number (prices vary according to needs). An effort to grab a piece of the burgeoning intranet software services market, Netcenter also

provides businesses with automatic software updates.

Netscape executive vice president Mike Homer says that Netcenter's Virtual Office will provide "a private home for small-business users on the Net." And CEO Jim Barksdale envisions the Web's biggest hubs—the most visited sites—as important vehicles for small companies to attract customers and communicate internally.

Higher Learning

The number of college students who use the Internet is expected to jump from 49 to 86 percent by 2002. Those who have access but don't use it will fall from about one-quarter today to 10 percent by 2002.



* Projected

Source: Jupiter Communications

Battery-Powered Computer?

Contrary to conventional wisdom, creating a dozen doughnuts could actually be a good source of energy—for your notebook, that is. The energy released by burning such sugary delicacies in your body has the potential to power computers, say researchers at the MIT Media Laboratory. They say such an approach could mean the end to notebook batteries.

Harnessing the energy expended during walking and running is a more likely scenario, because these activities use more energy. Researchers hypothesize that a special insert mounted in the heel of a shoe could store energy released by leg movements.

The only question is, where do you plug it in?

Body heat
2.4W–4.8W

Exhalation
0.4W

Blood pressure
0.37W

Breathing
0.42W

Arm motion
0.33W

Finger motion
0.76–2.1 milliwatts

Footsteps
5.0W–8.3W

Usable power generated
Source: MIT Media Laboratory

www.pcmag.com

Don't Miss The Debut Of NetTools

PC Magazine Online has expanded its networking coverage. Bookmark NetTools and learn about new LAN technologies.

Which Printer Is Right for You?

Planning a printer purchase? Use our interactive summaries of features to find the right model.

The Modern Speed You Really Need

Seek out the fastest Internet connection as PC Magazine Online covers the newest 56K modems.

Editors' Choices At Your Fingertips

Ready to shop? Don't forget that all of PC Magazine's Editors' Choices are available online.

Check In for These Web Extras

Daily industry analysis, up-to-the-minute reviews, and weekly commentary from John C. Dvorak, Michael Miller, and Don Willmott.

Pipeline



Web Application Delivery

Like the Maytag repairman, your network administrator will soon have a lot less work to do. A new specification in the works—Open Software Description (OSD)—is designed to make it easier for companies to install software and updates on any platform automatically over the Internet.

Like installation instructions, OSD describes what a computer should do after receiving software from a server. OSD is similar to a book's table of contents, describing the software and the relationships between its components and other software applications.

Marimba and Microsoft jointly proposed the specification, which is getting broad industry support from companies such as Cybermedia, Lotus, and Netscape. According to Lotus president Jeff Papows, "The OSD specification is a tremendous benefit to organizations seeking to provide a standards-based solution for online software distribution."

As the name suggests, OSD is based on open Internet standards, such as TCP/IP and HTTP, so it won't matter what push software your network manager uses.

For Microsoft, OSD fits into its strategy for reducing enterprises' total cost of ownership: Network administrators can save time when installing and updating software using push technologies rather than floppy disks. And Marimba plans to use the universal formatting scheme to help establish Castanet as a corporate standard.

The Search Continues

With just over a gazillion pages on the Web, navigating the far reaches of cyberspace without a search engine is nearly impossible. Now yet another search tool—Northern Light—has arrived.

Like its competitors, Northern Light searches Web sites for particular words, but it also searches over one million articles from 1,800 books, magazines, journals, databases, and news wires—most of which are not available from other search sites. (Instead of selling advertising space, the company charges about \$1 apiece for articles.) This feature helps



Web searchers focus on what's relevant, says David Seuss, Northern Light's chief. "The Web is the ultimate expression of the problem of too much data and not enough information," he says.

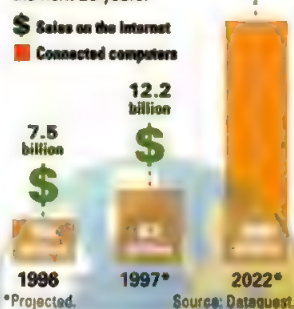
Microsoft reportedly has plans to enter the market as well, with a search engine code-named Yukon. Industry watchers say that a prerelease version should be available in October.

The Internet Census

Projections for the Web's growth are reaching stratospheric heights. A wave of new data released in the past two months points to big numbers of Internet users and big revenues at commercial Web sites. According to market research firm Dataquest, the number of computers connected to the Internet will leap by more than 70 percent this year to 82 million, with corporate intranet seats consti-

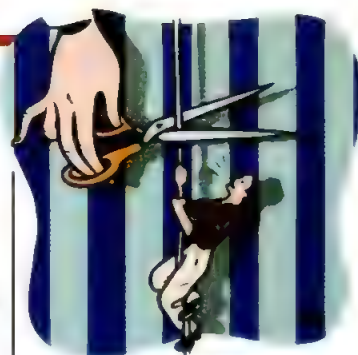
More Connections, More Revenues

Current projections have Internet connections and revenues soaring over the next 25 years.



tuting the bulk of that growth. By 2022, it projects, 268 million computers will be online.

Dataquest also says that sales of Internet software and services this year will generate \$12.2 billion, a 60 percent jump over last year's figure. Come 2022, it expects that sales will have risen to a whopping \$32.2 billion.



Thinking of a Start-Up?

Just when building an Internet company has begun to feel like a safe bet, the money you need may be drying up. Venture capital investment in established Internet companies is nearing record heights—\$561 million in the second quarter of 1997—but money for new projects is becoming scarce.

According to a recent Price Waterhouse survey, out of the 111 Internet-related companies that received funding in the second quarter, only eight are classified as start-ups or seeds. "The market for those companies that depend entirely on the Internet for their business model, such as Internet access providers, is saturated," says Kirk Walden, national director of the survey. New companies that received funding tend to use the Internet as a tool for their businesses. One example is Gigapacket Networks, a Littleton, Massachusetts-based developer of hardware and software for Internet backbone providers.

Top-Selling Notebooks

- 1 Toshiba Satellite 225CDS 133 (\$1,936)
- 2 Toshiba Satellite Pro 430CDT 120 (\$2,200)
- 3 IBM ThinkPad 365X 133 (\$1,117)
- 4 Fujitsu Lifebook 420D 120 (\$1,553)
- 5 Compaq Armada 4120 120 (\$1,258)
- 6 Compaq Presario 1610 150MMX (\$2,909)
- 7 Toshiba Satellite 220CDS 133 (\$1,947)
- 8 Hitachi VisionBook+ 133 (\$1,780)
- 9 Apple PowerBook 1400CS 603e (\$1,796)
- 10 Compaq Presario 1075 150MMX (\$2,620)

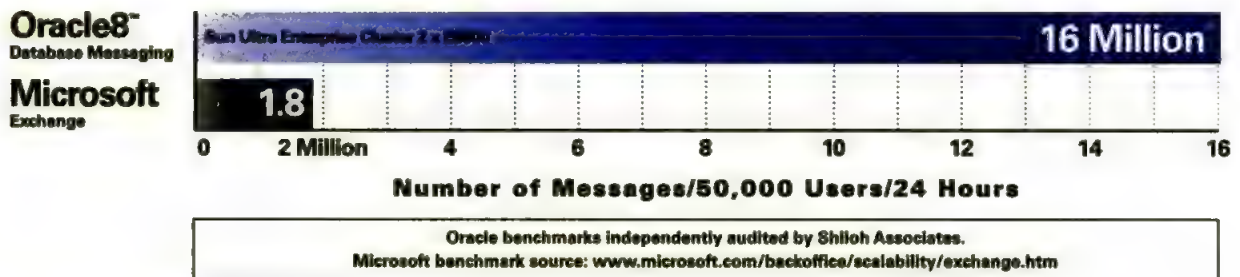
Source: PC Data. Data for July; based on retail and mail-order sales.

Oracle8 Database Messaging Massacres Microsoft Exchange

50,000 Concurrent Users. 16 Million Messages per Day.

Scalability

The scalability benchmark measures the electronic mail messages per day for 50,000 users.



Oracle Database Messaging

- 50,276 concurrent active users
- 16,031,520 messages in 24 hours on 1 Sun Ultra Enterprise Cluster Server
- 40 gigabyte message store
- Fully mirrored for fail-safe instant recovery from catastrophic failure
- 186 messages per second, 24 hours a day, 7 days a week, non-stop email
- Mission-critical performance and reliability for mission-critical messaging applications

Oracle InterOffice™ — the industry's first database messaging software, unifying application data, messaging and business processes in a single server.

To learn more about the benefits of integrated database messaging vs. stand-alone, file-based email, call Oracle at 1-800-633-0518, ext. 11827 to receive your free White Paper, or sign up for a free-trial InterOffice account at <http://www.interoffice.net>

ORACLE®
Enabling the Information Age™



AT 360 DPI
YOU SEE A LADY IN HER
BATHING SUIT.

AT 720 DPI
YOU SEE HER BATHING
SUIT IS WET.

YOU'VE GOT TO SEE IT IN

EPSON

COLOR.

AT 1440 DPI
YOU SEE HER BATHING
SUIT IS PAINTED ON.



An amazing paint job makes you think it's a bathing suit. These astonishing new printers let you know it's not. 1440 x 720 dpi. Photo Quality color. Laser-sharp black text. All from our exclusive Micro Piezo™ Technology—for a smaller, more consistent dot. You'll get print quality that's already won 33 major awards, including PC Computing's 5 Star Rating. In standard format or wide format. PC/Mac compatibility. Optional internal Ethernet. Up to 8 ppm black/7 ppm color on the Epson Stylus® Color 800. Plus a 2-year warranty. Call 1-800-GO-EPSON (ask for operator 3064) or visit us at www.epson.com for more details. For every detail, look at the output.

INTRODUCING THE WORLD'S FIRST 1440 DPI COLOR INK JET PRINTERS.



EPSON Stylus Color 800 about \$449. High-performance business printer.

EPSON Stylus Color 1520 about \$799. The versatile wide format printer.

CIRCLE 004 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

TWO COOL

SUPER COOLSCAN



COOLSCAN II

Two cool performers from Nikon, the world's first choice in film scanners. Super Coolscan. High performance film scanning for professionals. And Coolscan II. The personal desktop film scanner that gives you professional results.

Both give you 2700 dpi from 35mm positives and negatives. Both are Windows NT compatible. And they each deliver all the quality and speed that makes Nikon the clear scanning leader.

Nikon

For more details or to find the Nikon Dealer nearest you, call 1-800-52-NIKON. Or visit us on the web at www.nikonusa.com.



EDITOR-IN-CHIEF Michael J. Miller

EDITOR Jake Kirchner

EXECUTIVE EDITORS Bill Howard, Peter McKie, Gail Shaffer, Don Willmott

EXECUTIVE DIRECTOR, PC LABS C. James Galley III

ART DIRECTOR Laura Baer

SENIOR NETWORKING EDITOR Frank J. Derfler, Jr.

SENIOR ONLINE EDITOR John Clyman SENIOR EDITORS Leon Erlanger (Networking and Communications), Carol Venezia (First Looks), Sebastian Rupley (West Coast)

MANAGING EDITOR Paul B. Ross

RESEARCH EDITOR Jim Bartimo

SENIOR ASSOCIATE EDITORS Carol Levin (Trends), Sharon Terdeman (Technical Columns) ASSOCIATE EDITORS Jamie M. Bsaies (Hardware), Toni F. Kistner and Sarah L. Roberts (Networking and Communications), David Lidsky (Internet), John Morris (Software), Tom Ponzo (First Looks Online), Michael E. Ryan (After Hours), Anush Yeghazarian (PCs) ASSISTANT MANAGING EDITOR Kim Schueler PRODUCTION EDITOR Monica Sirignano COPY CHIEF Glen Boisseau Becker STAFF EDITORS Mary E. Behr, Robert Daly, Nancy E. Hirsch, Yvonne Koulouthros, Regina Kwon, Josh Levy, Elynn J. McCasland, Michael W. Muchmore, Melissa J. Perenson, Michael N. Rusignuolo SENIOR WRITER Robert S. Anthony STAFF WRITERS Karen J. Bannan, Angela Hickman, Cade Metz SENIOR COPY EDITORS Jennifer Golub, Joseph N. Levine COPY EDITORS Paul Dwyer, Michael Feist, Bill Kravitz, Barbara McGeech, Ann Ovodow ASSISTANT COPY EDITOR Pam Mangis PRODUCTION MANAGER Patricia Perkowski SENIOR LAYOUT EDITOR Lillian Gaffney LAYOUT EDITOR Michal Dluginski PRODUCTION SYSTEM SUPPORT ANALYST Nancy Goodman-Sleybeck LIBRARIAN Nancy Sirapyan LIBRARY ASSISTANT Dolores Williams EDITORIAL RESEARCHERS Jennifer L. Anderson, Gary Berline, Stephanie Lindenbaum, Amy Portnoy EDITORIAL ASSISTANTS Brett Krasnow, Leslie Sorich SYSTEM SUPPORT MANAGER Craig Ellison NETWORK SUPPORT ANALYST Melvin Acevedo COMMUNICATIONS MANAGER Patricia Reger ASSISTANT TO THE EDITOR-IN-CHIEF Christine Curti ASSISTANT TO THE EDITOR Rita Arahamian ASSISTANT TO THE EXECUTIVE EDITORS Christine M. Evelyn ADMINISTRATIVE ASSISTANT Christine Okang SYSOP, PC MAGNET Ken Hippie

CONTRIBUTING TECHNICAL EDITOR Neil J. Rubenking CONTRIBUTING EDITORS Bill Machrone (Editorial Director, New Products), Greg Alwang, Douglas Boing, Padraic Boyle, Bruce Brown, Brian Butler, Sheryl Canter, John C. Dvorak, Les Freed, Daniel Grotta, Sally Wiener Grotta, Michael J. Mefford, Edward Mendelson, Jan Ozer, Charles Petzold, Stephen W. Plain, Tony Pomplii, Alfred Poor, Jeff Prossie, John R. Queen, Sal Ricciardi, Steve Rigney, Winn L. Rosch, Joe Salemi, Jim Seymour, Barry Simon, Luisa Simone, Craig Sinson, M. David Stone

SENIOR ASSOCIATE ART DIRECTOR Richard Demler ASSOCIATE ART DIRECTORS Dean Markadakis, Michael Scowden ASSISTANT ART DIRECTOR Lora Morgenstern GRAPHICS DIRECTOR David Foster GRAPHIC ARTIST Mark Tyner ART PRODUCTION MANAGER Talar Min CONTRIBUTING PHOTOGRAPHER Thom O'Connor ASSISTANT TO THE ART DIRECTOR Frieda T. Smallwood

DIRECTOR, PC LABS, WEST COAST Steve Buehler TECHNICAL DIRECTORS Ben Z. Gottesman (Software), Nick Stam (Hardware) DIRECTOR, OPERATIONS John R. Delaney SENIOR PROJECT LEADERS Kristina DeNike (Networking and Communications), Jay Munro (Internet, PC Tech) PROJECT LEADERS Laura Cox (First Looks), Diane Jecker (Software), Jeff Mace (Graphics/Hardware), Robert Norton (Net Tools), S. Jee Yang (PCs) PROGRAMMERS Richard V. Dragan, Win Swarr PRODUCT TESTING MANAGER Charles Rodriguez TECHNICAL ANALYSTS Andrew Go, Melanio Lopez, Margaret A. Piemonte, Mark Valentine, Martin Wong SUPPORT TECHNICIANS Oliver Kaven, Jacqueline Paredes, Kevin Young INVENTORY CONTROL MANAGER Tom Kennedy INVENTORY CONTROL COORDINATORS Rob Graydon, Bryan Hughes, William Pagan ADMINISTRATIVE ASSISTANT Courtney L. Trabon

PC MAGAZINE CD

MULTIMEDIA PRODUCER Stephen Baldwin

PC MAGAZINE ONLINE

TECHNICAL DIRECTOR Larry Seltzer (Virtual Labs) ART DIRECTOR Albert Laraw MANAGING EDITOR Tin Albano SENIOR EDITOR Heather Crombie SENIOR PROGRAMMER William Ulrich SENIOR TECHNICAL EDITOR Thomas W. Giebel TECHNICAL EDITOR Webster T. Mudge DESIGNER Marcie Gandell STAFF EDITORS Troy Draier, Richard Egan, Tracy Kanevsky

VICE PRESIDENT, PUBLISHER Nancy Newman

NATIONAL ASSOCIATE PUBLISHER Pater Longo NATIONAL SALES DIRECTOR Vickie Pinsky BUSINESS DIRECTOR Andrew J. Cola ASSOCIATE BUSINESS MANAGER Christine Holsten GROUP MARKETING DIRECTOR Kathleen Goodwin ASSOCIATE MARKETING DIRECTOR John Wisdom RESEARCH DIRECTOR Gordon Plutsky EVENTS MANAGER Dawn Gudelis MANAGER, PROMOTION AND PUBLIC RELATIONS Lynne Hasluck

SENIOR ADVERTISING PRODUCTION MANAGER Susan Conrad ADVERTISING PRODUCTION MANAGER Robert Joy ASSISTANT ADVERTISING PRODUCTION MANAGERS Mark Cannady, Ivis Fundichely EDITORIAL PRODUCTION MANAGER Pamela J. Berkowitz COORDINATOR, EDITORIAL PRODUCTION Louise Laberge

ADVERTISING OFFICE: One Park Ave., New York, NY 10016-5802; 800 33 MAG AD, 212-503-5100

THE INDEPENDENT GUIDE

PC Magazine is the Independent Guide to Personal Computing. Our mission is to test and review products and report fairly and objectively on the results. Our editors do not invest in firms whose products we review, nor do we accept travel tickets or other gifts of value from such firms. Except where noted, PC Magazine reviews are of currently available products. We review products without regard to advertising or business relationships with any vendor. Softbank, the corporate parent of Ziff-Davis Inc., has made a number of strategic investments in high-technology companies. A list of those companies is available online at www.pcmag.com/faq, and we will alert our readers to such investments whenever pertinent.

HOW TO CONTACT THE EDITORS

We welcome comments from readers. Send them to Internet address pcmag@zd.com or to PC Magazine, One Park Ave., New York, NY 10016-5802. Please include a daytime telephone number. PC Magazine's general number is 212-503-5255. The West Coast Operations number is 415-513-8000. We cannot look up stories from past issues, recommend products, or diagnose problems with your PC by phone. For an index of past issues and a list of upcoming stories, browse www.pcmag.com.

If you are dissatisfied with a product advertised in PC Magazine and cannot resolve the problem with the vendor, write (do not call) Angela Tuka, Advertising Department, at the above address. Please include copies of your correspondence with the vendor.

SUBSCRIPTION SERVICES

The subscription rate is \$49.97 for a one-year subscription (22 issues). Additional postage for orders outside the U.S.: Please add \$36 per year (American currency) for surface mail. For subscription service questions and address changes, call 303-865-9930 in the U.S. or 303-864-7445 elsewhere. You can send faxes to 303-864-7455, or 303-864-0540 outside the U.S. Or write to PC Magazine, P.O. Box 54093, Boulder, CO 80322-4093. We periodically make lists of our customers available to makers of goods and services. If you do not wish to receive such mailings, please write to us and include a copy of your mailing label. For back issues (subject to availability), \$9 per issue (\$9 outside the U.S.), send check or money order to Back Issues Dept., Ziff-Davis Inc., P.O. Box 53131, Boulder, CO 80322-3131. Additional information on advertised products can be requested online at www.pcmag.com/ProductLink.

PC MAGAZINE CD

PC Magazine CD, the interactive CD-ROM companion to PC Magazine, is available quarterly. To order (\$49.95 per year in the U.S., \$72 in Canada, \$99 elsewhere), please call 800-335-1195, or 303-865-9930 outside the U.S. and Canada. Or write to PC Magazine CD, P.O. Box 59484, Boulder, CO 80322-9484.



PC MAGAZINE ONLINE

PC Magazine is on the World Wide Web (www.pcmag.com) and The Microsoft Network (Go to pcmagazine). We operate PC MagNet, an on-line service of ZDNet, hosted by CompuServe. (For details, see the Utilities column.) PC Magazine subscribers receive free access to our online archives.



PERMISSIONS, REPRINTS

Material in this publication may not be reproduced in any form without permission. If you want to quote from an article or use PC Magazine's logo in conjunction with an Editors' Choice designation, write Chantal Tucker or fax her at 212-503-5475; for information on reprints, please contact Ziff-Davis Reprints at 800-825-4237.

The following are registered trademarks of Ziff-Davis Inc.: DOSMark, NetBench, PC, PC DIRECT, PC Labs, Ziff-Davis Inc., PC MAGAZINE AWARD FOR TECHNICAL EXCELLENCE, PC MAGAZINE EDITORS' CHOICE, PC MagNet, ServerBench, WinBench, Winstone, and ZD.

The following are trademarks of Ziff-Davis Inc.: Abort, Retry, Fail?, After Hours, BusinessCard, Corporate Developer, CPUmark, Extending Your Apps, Features Plus, First Looks, First Looks Plus, Lab Notes, New & Improved, OFF THE STACK, PC Bench, PC Magazine At Home, PC Magazine CD, PC Magazine Marketplace, PC Solutions, PC Tech, Pipeline, Power Programming, Quick Clips, Read Only, ScreenDemos, Tech Notes, Tutor, User-to-User, WinDrain, ZDigit, ZDNet, and ZiffNet.

Other trademarks and trade names used throughout the publication are the property of their respective owners.

Copyright (c) 1997 Ziff-Davis Inc. All rights reserved. Reproduction in whole or in part without permission is prohibited.

MICRON™ MILLENNIA® MME 200

Intel 200MHz Pentium® processor with MMX™ technology
512KB pipeline burst cache, flash BIOS
48MB EDO RAM
4GB Ultra ATA hard drive
24X EIDE variable speed CD-ROM drive
3.5" floppy drive
100MB Iomega Zip drive
32 voice wavetable stereo sound with speakers
USR Sportster 56K x2 internal data/fax modem*
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
17" Micron 17FGx, .26dp (16.9" display)
Tool-free minitower
Microsoft® Intellimouse™, 104-key keyboard
Microsoft Windows® 95 and MS® Plus!
Microsoft Office 97 Small Business Edition
Choice of Software Solutions Paks
5-year/3-year Micron Power™
limited warranty

\$2,249

MICRON MILLENNIA Xku

Intel 266MHz Pentium II processor (features MMX technology)
512KB internal L2 cache, 2MB BIOS, 82440LX chipset
64MB EDO RAM
4GB EIDE hard drive
24X EIDE variable speed CD-ROM drive
3.5" floppy drive
100MB Iomega Zip drive
32 voice wavetable stereo sound with speakers
USR Sportster 56K x2 internal data/fax modem*
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
17" Micron 700 FGx, .26dp (16.0" display)
USB Connection
Tool-free minitower
Microsoft Intellimouse, 104-key keyboard
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
Choice of Software Solutions Paks
5-yr/3-yr Micron Power limited warranty

\$3,109

MICRON TRANSPORT™ VLx 133

133MHz Pentium processor
Intel 430MX chipset
256KB L2 pipeline burst cache
24MB EDO DRAM
2.1GB hard drive
11.3" DSTN SVGA 800x600
8X CD-ROM drive
16-bit stereo sound
Built-in stereo speakers and microphone
Motorola 33.6 fax/modem
128-bit graphics accelerator
Zoomed video-support
MPEG compatible
2 way infrared port
Touchpad pointing device
Modular floppy drive
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
Management Pak
Custom nylon carrying case
5-year/1-year Micron limited warranty

\$2,399

HP. PRINTER OPTIONS

HP Deskjet 692c printer - photo-quality color printing for the home, complete with cable\$59
HP LaserJet 6Lxi printer - affordable B&W printing, complete with cable\$429



* Same-day shipment is available for telephone or internet credit card orders successfully tracked by a Micron representative by 3:00pm MCT, Monday through Friday. This service is available to customers who have received approved credit and have their Computers Now! system shipped to the "bill to" address on their credit card.

MICRON POWER™ WARRANTY

5-year limited warranty on microprocessor and main memory
3-year limited on-site system warranty (1-year for Transport VLx)
1- 2- or 3-year optional on-site service agreement for Micron desktop and server systems
30 days of free Micron-supplied software support for Micron desktop systems, 3 optional
network operating system incident resolutions included for Micron server systems
30-day money back policy
24-hour technical support
The foregoing is subject to and qualified by Micron's standard limited warranties and terms
and conditions of sale. Terms and conditions of sale may vary for specific configurations.
Copies of the limited warranties may be obtained on our Web site or by calling Micron.



Micron Sales Hrs: Mon-Fri 6am-10pm,
Sat 7am-5pm (MT) Technical Support
Available 24 Hours A Day, 7 Days A Week
Toll free from Mexico: 95-800-708-1755

Toll free from Canada: 800-708-1758 • Toll free from
Puerto Rico: 800-708-1756 • International Sales:
208-893-8970 • International Fax: 208-893-7393

*Maximum transmission speed of up to 56Kbps when downloading data and
33.6Kbps when uploading. However, actual performance is dependent upon
numerous factors and observed transfer rates may be less than the
maximum potentials.



Extra Hot.

Heat things up with Computers Now!®

Order a Micron computer through our Computers Now! program for same-day shipment.* Our pre-configured systems are packed with Intel Pentium and Pentium II processors, some featuring MMX technology. Our Millennia Xku and MME models fire off power and performance for the most demanding user. And, our TransPort VLx delivers a portable that's affordable.

No matter which Micron system you choose, you'll always get our award-winning, 24-hour customer support and a great limited warranty you won't find on a shelf anywhere.

Call Computers Now! for a computer that turns up the heat — and really burns the other guys up.



Call now to order.
800-776-4509
www.micronpc.com



CONFIGURED FOR YOUR LIFE

©1997 Micron Electronics, Inc. All rights reserved. Micron Electronics is not responsible for omissions or errors in typography or photography. All purchases are subject to availability. Prices and specifications may be changed without notice; prices do not include shipping and handling and any applicable taxes. 30-day money-back policy does not include return freight and original shipping/handling charges, applies only to Micron brand products and begins from date of shipment. All sales are subject to Micron Electronics' current terms and conditions of sale. Lease prices based on 36-month lease. The Intel Inside Logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. Microsoft, Windows, Windows NT and the Windows logo are registered trademarks of Microsoft Corporation. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.
CIRCLE 203 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



MICRON VETIX Lxi-N

Intel 200MHz Pentium® Pro processor
32MB ECC EDO RAM
2GB Ultra-Wide SCSI-3 hard drives

STANDARD FEATURES

Dual Pentium Pro ZIF sockets
256KB integrated L2 cache
Memory upgradable to 1GB (8 DIMM slots)
5 PCI, 2 ISA, 1 shared ISA/PCI, 9 drive bays
Integrated Adaptec PCI Ultra-Wide SCSI-3 controller
Integrated Intel EtherExpress™ Pro 100 controller
12X SCSI-2 CD-ROM
Dedicated server technical support, 7x24
5-year/3-year Micron Power™ limited warranty
1-year next-business-day on-site service*

\$2,799

(list. base \$999/mo.)

MICRON VETIX Mxi-N

Intel 200MHz Pentium Pro processors
64MB ECC EDO RAM
2GB Ultra-Wide SCSI-3 hard drives

STANDARD FEATURES

Dual Pentium Pro ZIF sockets
256KB integrated L2 cache
Memory upgradable to 1GB (8 DIMM slots)
8 open expansion slots: 5 PCI, 2 ISA, 1 shared ISA/PCI
Integrated Adaptec PCI Ultra-Wide SCSI-3 controller
Integrated Intel EtherExpress Pro 100 controller
12X variable speed SCSI CD-ROM
5 internal, hot-swappable, hard drive array bays
(upgradable to 10)
3 external 5.25" media bays
1 (one) 330 watt power supply standard
(upgradable to 3 for added redundancy)
Dedicated server technical support, 7x24
5-year/3-year Micron Power limited warranty
1-year next-business-day on-site service*

\$4,699

(list. base \$160/mo.)

MICRON VETIX Lxi

Intel 200MHz Pentium Pro processor
64MB ECC EDO RAM
4GB Ultra-Wide SCSI-3 hard drive

STANDARD FEATURES

Dual Pentium Pro ZIF sockets
256KB integrated L2 cache
Memory upgradable to 1GB (8 DIMM slots)
5 PCI, 2 ISA, 1 shared ISA/PCI, 9 drive bays
Integrated Adaptec PCI Ultra-Wide SCSI-3 controller
Integrated Intel EtherExpress™ Pro 100 controller
12X SCSI-2 CD-ROM drive
15" Micron 500FGx, 28dp(13.7" display)
Microsoft® Windows NT® Server 4.0
(10-user license)
Intel LANDesk® Server Manager 2.52
Dedicated server technical support, 7x24
5-year/3-year Micron Power limited warranty
1-year next-business-day on-site service*
NOS Support (3 incident resolutions/
1st year), 7x24

\$5,099

(list. base \$160/mo.)

*On-site service for the Micron Vetix is provided by Worldspan/Associates and is subject to availability.

NETWORK OPTIONS

3Com OfficeConnect Hub 8/TPC	\$149	Sony 4/8GB SCSI DDS-2 tape backup drive with tape	\$749
3Com OfficeConnect Switch 140	\$969	Cheyenne ArcServe/InocuLAN-backup/antivirus	\$499
APC Smart-UPS 700 with PowerChute plus software	\$389	Novell IntranetWare 5-user licence (for Lxi-N and Mxi-N only)	\$699



Powerful Pair.

Some things were meant to be together. Take our ClientPro PCs and Vetix servers. This powerful pair effortlessly gets your network running – and keeps it running.

When you look for networking solutions, look first to Micron Vetix servers. We packed our hardy MXI server chock-full of features, like redundant power supplies, and high degree, fault-tolerant components including hot-swappable hard drives. And, we made our LXI server models expandable, reliable and tough. Complement your server with our ClientPro desktops. We've designed them to be easy to set up, easy to upgrade and easy to network. That means you reduce potential downtime and lower your total cost of ownership.



Best of all, we back our products. Every day. When you buy Micron, you can custom configure your system to meet your needs, so it's homegrown, not mass produced. When you buy Micron, you get the steadfast 24-hour customer support that we're famous for. And when you buy Micron, you get one of the best warranties in the business, from one of the best companies in the business.

Some things were meant to be together, all right. Like you and Micron.

MICRON CLIENTPRO® Mx1

Intel 200MHz Pentium processor with MMX™ technology
32MB SDRAM
2.1GB Ultra ATA Smart EIDE hard drive
16X EIDE Variable speed CD-ROM
15" Micron 500Lx, .28dp (13.7" display)

STANDARD FEATURES

512KB pipeline burst cache, flash BIOS, DMI Support
Intel Pro 100 with Wake On Lan NIC
S3 ViRGE graphics accelerator, 2MB EDO RAM
Chassis intrusion alert
Microsoft Intellimouse™
Microsoft Windows® 95
Intel LANdesk Client Manager
5-year/3-year Micron Power limited warranty

\$1,49

Bus. class \$20/mo.

MICRON POWER™ WARRANTY

5-year limited warranty on microprocessor and main memory
3-year limited parts-only system warranty (1-year for Linux/Port I/O)
1-, 2- or 3-year optional on-site service agreement for Micron desktop and server systems
30 days of free Micron-supplied software support for Micron desktop systems, 3 optional
customer operating system incident resolutions included for Micron server systems
30-day money back policy
24-hour technical support

The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.



Micron Sales Hrs: Mon-Fri 8am-10pm, Sat 7am-5pm (MT) Technical Support Available 24 Hours A Day, 7 Days A Week • Toll free from Mexico: 95-800-708-1755 • Toll free from Canada: 800-708-1758 • Toll free from Puerto Rico: 800-708-1756 • International Sales: 208-893-8970
International Fax: 208-893-7323

©1995 Micron Electronics, Inc. All rights reserved. Micron Electronics is a registered 28 International 48
series in typography or photography. All purchases are subject to availability. Prices and specifications may
be changed without notice. Prices do not include shipping and handling and any applicable taxes. 30-day
money-back policy does not include return freight and original shipping/handling charges, applies only to
Micron direct products and begins from date of shipment. All sales are subject to Micron Electronics' current
terms and conditions of sale. (Listed prices based on 30-mo. lease.) The Intel Inside logo and Pentium
are registered trademarks and Intel is a trademark of Intel Corporation. Microsoft, Windows, Windows
95 and the Windows logo are registered trademarks of Microsoft Corporation. Your product
name and other specifications for configuration purposes are subject to change.
We warrant that our products are new.

Call now to order.
800-295-0564
www.micronpc.com

CIRCLE 119 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink



CONFIGURED FOR YOUR LIFE

POLITICALLY CORRECT IN THE 90'S:



SAVE THE WHALES.



SAVE THE RAIN FORESTS.

You can't beat aperture grille technology for brilliant colors and crisp images. But you can beat the price with MAG InnoVision's Technitron™ series.

Whether it's \$349* for the 15" (13.9" VIS) DX15T or \$699* for the 17" (16.0" VIS) DX700T, you save big over what you'd pay for a comparable Trinitron® monitor by Sony. And at \$799,* you save even more on the 17" (16.0" VIS) DX715T with its DIAMONDTRON™ CRT.

What's the catch, you say? Well, you can save your concerns, too. Because Technitron monitors feature a super-fine 0.25mm stripe pitch in a choice of models offering non-interlaced resolutions of up to 1600 x 1200. Which makes them ideal for discriminating buyers who want the highest quality with the latest features.

So do the right thing and visit your MAG InnoVision Ultimate Reseller for a look at Technitron monitors today.

Then feel free to donate any money you save to your favorite politically-correct cause.



See us at Fall Comdex Booth #L5240



SAVE MT. RUSHMORE.



SAVE A BUNCH ON
TECHNITRON™ MONITORS.



THINGS HAVE NEVER BEEN BETTER™

MAG InnoVision Co., Inc., 2801 South Yale Street, Santa Ana, CA 92704, Call: 714-751-2008 or 800-827-3998.
Fax: 714-751-5522, MAGic Fax-On-Demand: 714-751-0166, Web Site: www.maginnovision.com

©1997 MAG InnoVision Co., Inc. Technitron is a trademark and MAG InnoVision and the MAG InnoVision logo are registered trademarks of MAG Technology Co., Ltd. Trialtron is a registered trademark of Sony and DIAMONDTRON is a trademark of Mitsubishi. All other trademarks are the property of their respective owners. *MSRP. Actual price may vary. Specifications subject to change without notice.

CIRCLE 038 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

HEY YOU PREPPY BONEHEAD!
You thought I was such a
GEEK in high school.
WELL I wrote something
for you. JUST
TURN ON YOUR COMPUTER.

All over the world nerds are getting their revenge. By writing computer viruses that get into your computer and do things like destroy your files or corrupt your operating system.

These viruses enter your computer over the internet, through email, or even by sharing computer games.

But VirusScan thwarts these threats completely. Its Hunter Technology detects 100% of the world's known viruses. And our unique SecureCast feature automatically pushes updates to your PC to protect you from the latest virus strains.

Designed for

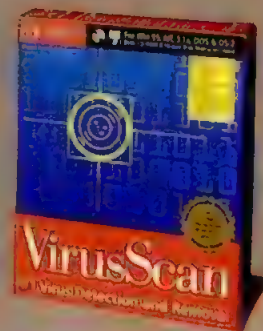
Microsoft®
Windows NT®
Windows® 95

Novell.

TESTED
& APPROVED

Maybe that's why VirusScan is the leading anti-virus software, with over 25 million customers.

Install VirusScan on your computer. You'll sleep easier. Even if you didn't insult the guy with the thick glasses back in high school.



Because there are a lot of sick people out there.

McAfee®

Letters

NOT GOING TO MEMPHIS

Your article "Windows 98: Memphis & IE 4.0" (September 9, 1997) seemed to praise the fact that the Web's interface was coming to the PC desktop. I find the Web's interface mediocre at best and not something I want to deal with all the time. For power users who grew up with DOS, Windows 95 (when used with PowerToys) provides an excellent mix of a GUI with old-time functionality. I strongly hesitate to use any product that is going to turn my PC into an extension of the Web.

DAN MORRISON
Tillson, New York

The article "Memphis & IE 4.0" contains the following statement: "It's too early for a final analysis, since neither Memphis or IE 4.0 is as stable as you would like a final product to be...." It's time to quit using the euphemism "unstable" and to call a bug a bug. The only way we will ever get bug-free software, especially operating systems, is to take the offensive and hold the vendor's feet to the fire—even if it happens to be the world's richest corporation. I for one am not ready for the Internet to be integrated into my desktop, and I'm not sure I ever want it to be. I have no use for unlimited Internet access and hope I never will have.

BERNARD H. GEYER
via the Internet

What I want is a small, bulletproof OS with a clean desktop where I can put a few applications (word processor, spreadsheet, database, communications interface, and some specialized engineering programs). I don't care if they can multitask. I can handle only one thing at a time; print spooling, uploading, and downloading as background tasks are fine. I don't need to browse my desktop to find things.

Microsoft seems intent on pushing a PC world with Rolls-Royce products that are overweight, are poor in quality, and run on only seven cylinders. I think there is a market for people like me who want pickup trucks: reliable, simple, easy to maintain, and productive. I guess I'm out of touch with the real world in thinking that the PC should be only a tool and not an end in itself. I'm tired of spending most of my online time trying to find out why programs crash on setup, why they crash for no apparent reason, why they're not printing properly, and so forth.

BILL WAGGENER
via the Internet

I've been reading with great interest about Microsoft Windows 98, including its ability to use multiple modems in a single computer for



I strongly hesitate to use a product that will turn my PC into an extension of the Web.

greatly improved throughput. At first glance, this is a wonderful idea. In fact, I thought of it months before your article. After thinking about it more, however, I'm not so thrilled with it. The Internet, as it stands, is already close to the saturation point. Since not everyone wants to spend the money for another phone line and modem, I don't expect a significant number of existing Internet users to take advantage of the new technology. Most ISPs are currently getting their data lines from AT&T's excess bandwidth, and I think this will disappear rather quickly.

TRAVIS CREAGER
via the Internet

NOT OF THIS EARTHLINK

My experience with EarthLink, your Editors' Choice for an ISP, was contrary to yours. Earlier this year, I signed up with EarthLink and paid my \$25 registration fee. After two long waits to reach the EarthLink home page, I realized that these guys didn't have the horsepower to support their site. I called to cancel my subscription and asked for my \$25 back, since I hadn't even been able to log on to their home page to finish registration. They refused me but were kind enough to waive my first month's charges.

MIKE WHITE
via the Internet

Your Editors' Choice for ISPs confused me. My provider, Netcom, was highly criticized for extra fees associated with high-speed modem connections. At the same time, EarthLink charges \$4.95 per hour for 56-Kbps access, compared with Netcom's \$5 per month. There

is no mention of these high-speed access fees in your EarthLink review. I don't understand why this weighs so heavily in your evaluation of Netcom but not EarthLink.

MICHAEL SOTTILE
via the Internet

The international business traveler's ISP needs are greater than your average reader's, and e-mail is usually our lifeline to both office and family. I searched for years to find the best provider. IBM Internet Connection proved to be the salvation for me and many of my colleagues. I have consistently connected to IBM's network, available in many countries, without any problems at high speeds. It also gives us five e-mail accounts for one monthly charge. The dialer is simple to install and use, and when needed, IBM's support has been exemplary. In Indonesia, my system went down; I took it to IBM's office and was back online 1 hour later.

CHRISTOPHER R. BENNETT
via the Internet

DISREGARDING THE PROTOCOL

When I first read "When 200 Milliseconds Matter" (Trends/Inside PC Labs, September 9, 1997), I thought that Microsoft had rewritten the TCP specification. Then I realized that Microsoft (and other companies) just hadn't wanted to comply with the specification. Sun's implementation of the congestion-window setting is much closer to the specification.

As you pointed out, you have to check your software and your hardware against multiple platforms. But isn't the specification, practically by definition, supposed to eliminate that need? Then you shouldn't have to check. The specification probably needs to be changed, as evidenced by the technical advantages you listed. Until it is, however, you can't penalize those who follow it.

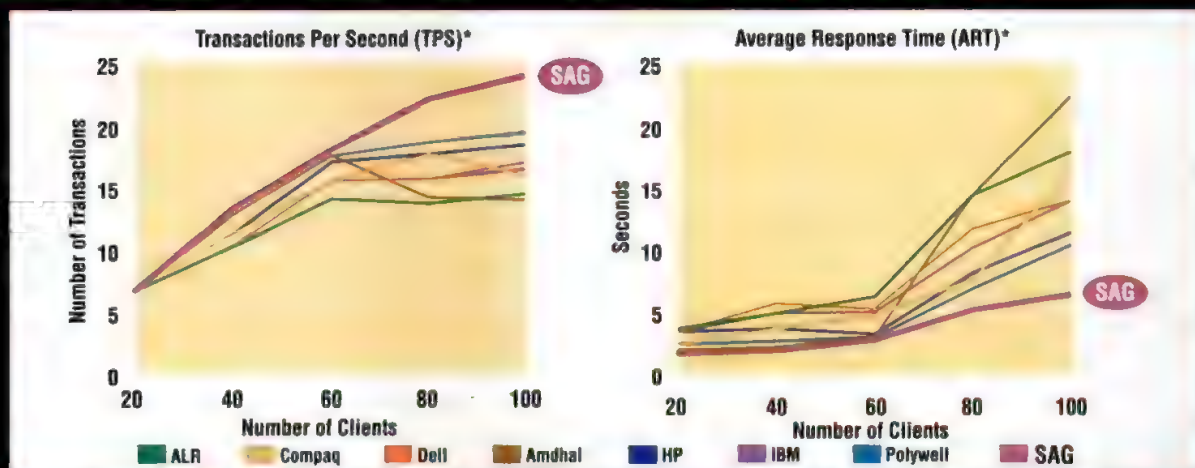
JEFF KETZLE
Miami, Florida

INDECENCY AND PROPOSALS

I strongly disagree with Jake Kirchner's lament about the Supreme Court's discussion on what would have amounted to censorship of the Internet ("The CDA is Dead. How Come I'm Not Happy?", September 9, 1997). His complaint about what children might see or read galls me. I can't understand why children should be on the Web in the first place. If they need information for a school project, they should go to the library. If parents like Kirchner feel that their kids must access the Internet, then it's their problem to oversee the situation. Censorship is censorship, no matter how you slice it. The

"SAG offers the best

NETWORK COMPUTING PRODUCT TESTING RESULTS*



SAG Electronics proved to be the performance champ in an independent test by Network Computing. Going against the biggest names in the industry, "SAG offers the best price/performance." Proving if performance (and price) counts in your business, you can count on SAG.

WORK STATIONS

STA DUAL PENTIUM 300 MHz CAD

- Intel Pentium 300 MHz CPU Upgradable to 2 CPUs
- 64MB of RAM Expandable to 512MB, ECC Supported
- Symmetric 40MB MX Open GL Video
- Slots: (6) PCI, (2) ISA
- Integrated Dual Channel Ultra Wide Controller Upgrade Path to Raid 5
- Sony 24x CD-ROM
- 9.1GB 10,000 RPM UW Removable HD
- JAZ 1GB Removable
- Keyboard, Floppy, Mouse
- Tower Case

\$5859

Symmetric 16 & 8MB Video Available

STF PENTIUM II DUAL 266 MHz

- 1 Intel Pentium II 266 MHz Processor, Upgrad. to 2 CPUs
- 512K Cache
- Slots: (5) PCI, (4) ISA
- 64MB of RAM Expandable to 512MB ECC Supported
- #9 Revolution 8MB Video
- Adapter 2940 UW
- 4.3 GB Ultra Wide IBM 8.5 ms
- Sony 24x CD-ROM
- Keyboard, Floppy, Mouse
- Tower 300 Watt Power

\$2595

6.4 IDE 9.5ms Solution

\$2450

STA CLIENT PENTIUM 200 MMX

- 1 Intel Pentium 200MMX CPU
- 32MB RAM, Expandable to 128MB
- Seagate 2.1GB IDE
- #9 772 4MB-RAM, Video
- Sound & Speakers
- Sony 24x CD-ROM
- Keyboard, Floppy, Mouse
- Mid Tower Case

\$1183

Intel Low Desk Option Available DMI Compliant

STA ALPHA 533 MHz

- 1 Dec Alpha 533 MHz CPU
- 1 MB - SRAM Cache
- 64 MB of Memory
- 4.3 GB 10,000 RPM UW Removable HD
- Adaptec 2940 UW
- #9 Revolution 8MB Video
- Sony 24x CD-ROM
- Keyboard, Floppy, Mouse
- Tower Case 300 Watts

\$4499

8.16 & 40MB Open GL Video Cache Available

SAG's Dual Pentium
Pro RAID 5 Servers
6/1/97

Fastest CAD
Card Available

Alpha 500
Server
7/1/97
8/1/97
9/1/97
PC Computing
THE A LIST

Hours 8:30am - 7:00pm • North Andover, MA

Fax 508.689.0180 GSA Schedule: GS-35F-3103D

AT&T on-site and 4 year extended warranties are available. Lease options available. Returns may be subject to restocking fee. RMA # must be acquired. Some devices have not been approved by the Federal Communications Commission. These devices are not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

MORE AWARDS



9/24/96
SAG STA Pentium
Pro 200



2/20/96
SAG STF
166 Pentium



2/20/96
SAG STF
150 Pentium

price/performance."

Network Computing June 1, 1997



SERVICES, RAID 5 SUBSYSTEMS & STORAGE SOLUTIONS

The STF Line is our high end built to order product line. Each system is specifically designed for each customer, solving the issues of price, performance, reliability (fault tolerance), growth and ease of use. Our specialty in RAID technology has produced servers that are unique in the industry. Each features on-line storage expansion for hassle-free growth. Our boot-up configuration allows easy connections to all major O/S using GUI RAID Manager. Every server supports 15 drives per channel with up to 28MB Cache. And a powerful 32-bit RISC Processor gives the best performance in the industry.

STF RACKMOUNT QUAD

- 2 Intel Pentium Pro 200 MHz Exp. to 4
- 512K Cache
- 128MB of ECC 4 way Interleaved Memory to 1GB
- Slots (6) PCI; (4) ISA
- 9 1GB 10 000 RPM Ultra Wide Removable HD
- #9 2MB DRAM Video
- PHLA8465B Ethernet 10/100
- Sony 16x CD-ROM
- Keyboard, Floppy, Mouse
- Rackmount Case with Redundant Power
- Server Management Software and Alarm Option Available

\$9800

File Server Cases Available

STF DUAL PRO 200 MHz

- 1 Intel Pentium Pro 200 MHz Processor
- Upgradable to 2 CPUs
- 256K Cache
- 64MB of RAM Expandable to 1GB
- Slots: (5) PCI, (4) ISA
- PHLA 8465 B Ethernet
- 9 1 GB 10,000 RPM UW Removable HD
- Adapter 2940 UW
- #9 2MB Video
- Keyboard, Floppy, Mouse
- Sony 16x CD-ROM
- Tower Case 300 Watt

\$3128

Server Management Software & Alarm Options Available

STF PENTIUM II 300 MHz RAID 5

- 1 Intel Pentium 300 MHz CPU
- Upgradable to 2 CPUs
- 64MB of ECC RAM Expandable to 512 MB
- Integrated on Board 2 Channel, RAID 5 Controller, 2MB PCI Video
- Open Slots: (6) PCI, (2) ISA
- Q: (3) 4 3GB 10 000 RPM UW Removable HD
- Sony 16x CD-ROM
- Adapter 10/100 PCI Ethernet
- Keyboard, Floppy, Mouse
- 13 Bay Tower with 400 Watt Redundant Power Supplies
- Server Management Software

\$6499

RAID 5 FOR ANY COMPUTER SYSTEM

STC2000 20 BAY REDUNDANT ULTRA CONTROLLER SOLUTION

- Q: 2 3-Channel RAID 5 UW Controllers
- Both controllers are **ACTIVE**, giving ultimate performance. If one fails, the remaining controller automatically performs all functions.
- This gives the user the ultimate in performance and safety!
- 20 Hot-swappable Drive Bays
- 8 230 Watt Hot-swappable Redundant Power Supplies
- Sensor Panel Monitors:
 - Internal Temperature - Status of Individual Power Supplies
 - Status of Individual Cooling Fans - Visual and Resettable Audible Alarm
- 128 MB of Cache



STC7000 RACKMOUNT SOLUTION

- 3-Channel RAID 5 UW Controllers • 6 Hot-swappable Drive Bays
- 2 300 Watt N+1 Hot-swappable Redundant Power Supplies
- Sensor Panel Monitors: - Internal Temperature - Status of Individual Power Supplies - Status of Individual Cooling Fans - Visual and Resettable Audible Alarm

STC8000 RAID 5 SOLUTION

- 3-Channel RAID 5 UW Controllers • 8 Hot-swappable Drive Bays
- 2 300 Watt N+1 Hot-swappable Redundant Power Supplies
- Sensor Panel Monitors: - Internal Temperature - Status of Individual Power Supplies - Status of Individual Cooling Fans - Visual and Resettable Audible Alarm

STC2000 72GB Solution
Q: (8) 9.1GB 7200RPM UW HD

\$22289

STC2000 72GB Solution
Q: (8) 8 1GB 10 000RPM UW HD

\$24132

STC2000 32GB Solution
Q: (8) 4.3GB 7200RPM UW HD

\$18867

STC7000 or
STC8000 17GB Solution
Q: (4) 4.3GB 7200RPM UW HD

\$7671

STC7000 or
STC8000 18GB Solution
Q: (4) 4 5GB 10 000RPM UW HD

\$8253

STC7000 or
STC8000 27GB Solution
Q: (3) 9.1GB 7200RPM UW HD

\$8240

SEE OUR WEBSITE FOR A COMPLETE LINE OF OUR DISK STORAGE SOLUTIONS

www.sagelec.com

1.800.989.3475

CIRCLE 309 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

SAGE

ELECTRONICS

The Intelligent Choice

Letters

Internet is an adult medium. Let's strive to keep it that way.

MARK STANWICK
via the Internet

While I agree that the Communications Decency Act was poor legislation and that attempts to regulate Internet content are very misguided, I strongly disagree that children "have more unfettered access to harmful, misguided, inaccurate, and dangerous material than any generation before."

Children tend to have much more attention and respect for their peers than for parents and adults. The advantage of the Internet is that we, as adults and responsible parents, can control our children's access to it. Simply placing the computer with Internet access in the family room instead of in the children's room goes a long way in monitoring what material they access. If our children want to access objectionable materials, I am certain their classmates will provide it. The Internet is the least of our worries.

R. O. DOMITZ
Copperas Cove, TX

Thanks to Kirchner for having the guts to call a spade a spade. There's no question in my mind that the Internet today is part sewer, part madhouse, and part 1984. As a minefield, it ranks second to none. Right now, the best thing we have to rely on is the printed word: newsletters, magazines, and newspapers. Here, content and quality level can be determined by the type of people who are selected for key posts.

JACK FREYMULLER
Warminster, Pennsylvania

HOW TO CONTACT US--

We welcome your comments and suggestions. Please send Letters to the Editor via

E-MAIL pcmag@zd.com

FAX 212-503-5799

MAIL Letters, PC Magazine, One Park Ave., New York, NY 10016-5802

COMPUSERVE To reach individual editors as listed on ZDNet, type GO PCMSTAFF.

All letters become the property of PC Magazine and are subject to editing. We regret that we cannot answer letters individually. To send submissions for PC Solutions, please see the sidebar "How to Contact Us" on the last page of that column.



To send submissions for PC Solutions, please see the sidebar "How to Contact Us" on the last page of that column.

CORRECTIONS AND AMPLIFICATIONS

In the After Hours column of October 7, 1997, we incorrectly reported that Electronic Arts' Triple Play 98 has no bullpen. While this feature is not available in arcade mode, it is included in simulation mode.

Subsequent to our September 9, 1997, article "Choosing Your ISP," we were told that the ISP Netcomplete (Netcom) offers 56K service to its subscribers to x2 technology for \$5 in addition to its monthly fee. This surcharge applies only to subscribers to Netcom's Advantage Service (\$24.95/month). Subscribers to the basic service (\$19.95 a month) must initially upgrade to the Advantage service before they can connect at 56K speeds. Thus it costs a basic subscriber \$10 in addition to the original flat rate, or double the advertised \$5 surcharge.

In the gatefold section of the same article, we mistakenly stated in the Sprint report card that Sprint charges \$5 per month for 56K access, when in fact Sprint doesn't offer 56K access at all. We stated the correct information in the review and features table.

In our August 1997 cover story, "Portable Desktops," the Suitability to Task rating for the Broadax NP6280A as a road warrior should be *good*, and in the features table its travel weight should be listed as 8.3 lbs. In the same article, the road warrior rating for the MOS 200MMX Power User should be *good*, and in the features table its travel weight should be listed as 9.0 lbs.

The Internet is not for children. Let us have one place where we can display the extent of humanity in all its crass vulgarity without fearing the depredations of censorship. Law enforcement officials should monitor it so that they may apprehend criminals such as child pornographers.

DIANE WESTERFIELD
via the Internet

VAGUERY

I found Bill Howard's column "In the Interest of Everyone" (September 9, 1997) a bit convoluted. At the end, I didn't know if it was okay to let my employees take paper home with them, and I didn't know if was acceptable for me to order software that might also get used in my side business. I'm not certain what prompted him to choose the topic, and I'm not certain of his stance on the issue. It would have been helpful if he'd had some numbers to cite on both sides of the argument.

JEFFERY ARNOLD
via the Internet

LCDs NOT PERFECT

The First Looks reviews of new LCD monitors ("In Through the Thin Door," September 9, 1997) pointed out that this crop of monitors is easy to set up because they connect to a standard VGA cable. This is indeed convenient, but a digital interface would provide a superior method for conveying the pixel matrix from the video card to the screen. The analog interface, which was designed with a CRT in mind, results in interpolation and data loss by the liquid crystal display, and thus is responsible for the odd artifacts. I assume that a digital standard must be in the works; I'd like to know when this might hit the shelves. I think if it's worth getting an LCD monitor, it's worth holding out for one that isn't hobbled by this weak link.

DAVID ROLFE
via the Internet

COOKIE CRUMBLING

After reading the article on cookie managers ("Internet Security: Protection at the Desktop," September 9, 1997), specifically the review of Cookie Crusher 1.01, I suggest you review versions that are presently in release (in this case, Version 1.5.3). I've had Cookie Crusher for quite some time, and it is fantastic in being literally able to stop any cookie that any site attempts to set on me. I also barely notice it since it's so fast and reliable.

TERRY J CLARK
Hollywood, Florida

CHOICE CHATTING

While I found your article "Chat Software: Talk of the Internet" (September 9, 1997) interesting, I was extremely disappointed in the absence of what I believe to be the best Virtual online chat service on the Internet: WorldsAway. I am not a very chat-oriented person—I hate IRC and other chat services—but WorldsAway is different. It is more than chat, offering a complete interaction with other "avatars" (animated characters that you create) and objects inworld. You can earn money and purchase items of value, making the experience much more lifelike. Its interface is also easy to use.

MIKE PERKLIN
via the Internet

A LITTLE PUSH IS OKAY

I disagree with Jim Seymour's comments in his August 1997 column ("Push Back!"). PointCast provides a well-needed solution to the large problem of Web surfing while being user-friendly, powerful, and bug-free. The advertising within it has not been a problem because it's not dumped all at once, only little by little. If it bogs down your bandwidth that's because you haven't set it up correctly or because you need better bandwidth.

BOLTON K. WINPENNY
New York, New York

Forget all the promises
about 100Mbps costing
the same as 10Mbps.



It's already happened.

\$135

**CreditCard
Ethernet 10/100 Upgradable**

This 10Mbps Ethernet PC Card is upgradable to 100Mbps with the simple purchase of a new adapter cable.

\$155

**CreditCard
Ethernet 10/100 Ready**

Connects notebooks to either 10Mbps Ethernet or 100Mbps Fast Ethernet networks. Seamless 10Mbps and 100Mbps connectivity means you won't have to upgrade when you move to Fast Ethernet.



\$179

**CardBus
Ethernet 10/100**

This 32-bit CardBus adapter connects CardBus-equipped notebooks to 10Mbps and 100Mbps Ethernet networks with the fastest notebook-to-LAN connection available, closing the performance gap between notebooks and desktops.



Our proposition is simple: 100Mbps adapters for virtually the same price as 10Mbps adapters.

The CreditCard Ethernet 10/100-Ready prepares you for 100Mbps at nearly the price of a 10Mbps-only card. If Fast Ethernet isn't in your plans yet, the CreditCard Ethernet 10/100-Upgradable gives you great 10Mbps performance now, with 100Mbps when you're ready for it.

And for the fastest performance, the CardBus Ethernet 10/100's 32-bit, PCI-based design makes CardBus-equipped notebooks perform like desktop systems.

Whatever your situation, Xircom's award-winning Fast Ethernet family can give you the speed you need now, plus the speed you need for the future, at today's 10Mbps prices. Call us at 800-438-4526, or visit the Xircom Web site at www.xircom.com/100a. For multi-pack and volume pricing call your authorized Xircom reseller.

Xircom
The Mobile Networking Experts.

ON A BUSY DAY,
THERE'S NO SUCH THING
AS A SIMPLE UPGRADE.





Introducing the easy-access chassis. Getting inside a server is often half the battle of upgrading it. To help, AST® introduces a new FlexChassis design that allows full access to the interior of our server in seconds. All boards slide in and out, making upgrades and maintenance quick and easy. Additional time-saving features include hot-swap redundant power supplies and disks. And our standard limited warranty for servers offers on-site technician response by the next business day, or, in just 4 hours with our optional Guardian Care™ program. Visit us at www.ast.com for more information about AST's Premium® servers with Intel® Pentium® II processors with ECC. Or call 1-800-945-2278.*

Premium HS		
Up to 300 MHz dual Intel Pentium II processors with ECC	Rack mountable server FlexChassis design	Integrated SMART Ethernet and RAID subsystems
Intel 440 LX AGP chip set	Up to 9 1 GB 10,000 RPM Ultra/Wide SCSI hard disk drives	Redundant, hot-swap power supplies and drives
12 hot-swap drive bays		

AST
COMPUTER

Working for your business.

CIRCLE 122 ON READER SERVICE CARD

Trends

The Great Java Rift

Is this Web wonder kid a language, a platform, or both?

Born two and a half years ago as a programming language for the Web, Java is growing into a full-fledged platform that not only can run on every conceivable variation of computer—Windows, Macintosh, and Unix machines as well as network computers and future Web appliances—but also can liberate us from the Sisyphean cycle of operating-system upgrades. At least that's how Sun's CEO, Scott McNealy, spins the Java story. Microsoft CEO Bill Gates, on the other hand, has some different ideas.

"Microsoft is not out to toe the line of a competitive operating system," says Eric Brown, a senior analyst at market research firm Forrester Research. Sun positions Java as an agnostic platform that is not tied to one type of computer or company, but Microsoft would prefer to see Java with clipped wings: strictly a programming language.

Industry heavyweights IBM, Netscape, and Oracle are supporting Sun's 100% Pure Java Initiative, which calls for adherence to specifications ensuring that Java applications will run optimally on every machine. "Outside the firewall, you don't know what people are running, and you can't tell them what to run," says Netscape CEO Jim Barksdale.

IBM, Netscape, and Sun recently opened the Java Porting and Tuning Center at Sun headquarters in Mountain View, California. There the companies will collaborate on improving Java performance, and they'll provide develop-

ers with access to a high-performance Java environment to ensure that new applications will perform consistently across all platforms. The



very existence of such a center, though, indicates that developers are having a tough time of it. Developers are finding that Microsoft Internet Explorer and Netscape Navigator handle Java applications inconsistently. Sun touts Java's ability to run everywhere, yet developers are finding that it can be everywhere only after it's tested and tweaked. As reported in our issue of May 27, 1997, PC Magazine Labs found that Java programs that ran fine in testing on one platform were unstable on other platforms. So much for "portability."

Although Microsoft rejects the 100%

Pure Java initiative, its Java implementations do allow the development and execution of pure Java. The company's Java Software Development Kit doesn't force developers to write Windows-specific programs; it just facilitates "native calls," or procedures that take advantage of Windows. Some players perceive this move as tying developers to Windows, but Microsoft sees it as offering a better way to run Java.

The jury is still out on whether Java will succeed as a platform. A Forrester survey of 50 Fortune 1000 companies found that nearly half are using no Java applications, 36 percent are using experimental apps, 12 percent have deployed "low-impact" apps, and 4 percent have deployed mission-critical applications with Java components. Two years from now, 56 percent of the companies expect to be using mission-critical applications with Java components.

A lot can happen in just two years of Internet time, though. Forrester's Brown comments with regard to Microsoft and Sun, "One is talking evolution; the other is talking revolution." He adds, "Microsoft is saying it'll give companies a slow migration path that's compatible with the existing environment. Microsoft will deliver a much more digestible message, because its message is evolutionary." In the end, perhaps the argument is moot. "Sun says Java is a platform, and Microsoft says it's a language," says David Dewan, vice president of product strategy at SilverStream Software, maker of a Java application development program—the largest Java application to date. "We don't care. It's a great place to run applications."—Carol Levin

The Early Years



Dec. 4, 1995 Netscape and Sun announce JavaScript.
Dec. 8, 1995 IBM and Silicon Graphics license Java.



Sept. 1996 Nearly 60 universities offer Java classes.
Oct. 8, 1996 Sun completes JavaBeans API.
Oct. 29, 1996 Sun announces JavaStation network computer.

March 31, 1997 100% Java license signed.
Aug. 26, 1997 IBM, Netscape, and Sun announce Java Porting and Tuning Center.



May 23, 1995 Sun introduces Java. Netscape becomes first Java licensee.



Jan. 23, 1996 Sun announces Java Developers Kit 1.0.
Feb. 1996 Netscape releases Navigator 2.0 with Java support.



Dec. 11, 1996 Apple, IBM, Netscape, Oracle, and Sun launch 100% Pure Java Initiative.

Early 1998 Netscape scheduled to release 100% Pure Java Netscape Navigator.

Internet Capers

Law enforcement cracks down on electronic con artists and schemes.

When Carlos Salgado, Jr. (a.k.a. SMAK), showed up at San Francisco International Airport ready to sell a CD-ROM full of stolen credit card numbers for \$260,000, he walked smack into an FBI sting. The 37-year-old computer repairman has pleaded guilty to trafficking in stolen credit card numbers and to engaging in computer fraud.

Using a packet-sniffer program he wrote, Salgado infiltrated presumably secure servers and collected 100,000 credit card numbers from an Internet service provider and half a dozen companies that conduct transactions over the Web. Although he never used the card numbers, he perpetrated the crime for profit, not for thrills.

Meanwhile, the Federal Trade Commission recently issued warnings to over 30 Web sites that may be exaggerating the profit potential of get-rich-quick coupon schemes. And a Web site posing as America Online recently duped some AOL subscribers into providing billing information. AOL shut down the site within hours.

In response to a rise in illegal activities on the Web, the FBI has expanded by 50 percent the staff investigating computer-related exploitation of minors and set up a task force on computer child pornography. States are also gearing up to go after pyramid schemes, credit card capers, and child pornography. For example, in New York, State Attorney General Dennis Vacco is setting up an eight-person Internet crime bureau for investigating "business opportunity" scams, gambling, child pornography, and junk e-mail. The unit will rely on tips from Web surfers (a complaint form is available on its Web site) and on its own investigators, who will search the Web for illegal activities.

Meanwhile, Web sites are beginning to offer Web shoppers some peace of mind. Excite's Certified Merchant Program, for example, offers a "safe shopping guarantee" at its 25 online retailers, including Amazon.com, The Disney Store Online, J. Crew, Tower Records, and Wal-Mart Online. If your credit card company determines that an Excite merchant has committed fraud, Excite will reimburse you for any liability that the credit card company doesn't cover.—Carol Levin



The Real Story Behind the FCC Label

HAS YOUR COMPUTER PASSED MUSTER WITH the Federal Communications Commission (FCC)? More than half of the 100 systems we're evaluating for the issue of December 21, 1997, have no FCC IDs or labels. And we see many systems, particularly identical notebooks sold by different vendors, using the same ID. We don't consider ourselves the FCC police, but we feel it's necessary to investigate the issue.

The FCC mandates acceptable levels of the electrical emissions that PCs radiate into the air and conduct over AC power lines. Computers used only in businesses must pass the "Class A" tests; those in homes must pass the more rigorous "Class B" tests. The goal is to prevent interference with stereos, TVs, and other sensitive electronic devices. Even though you may have never observed such interference, the FCC's standards, testing, and enforcement measures are important.

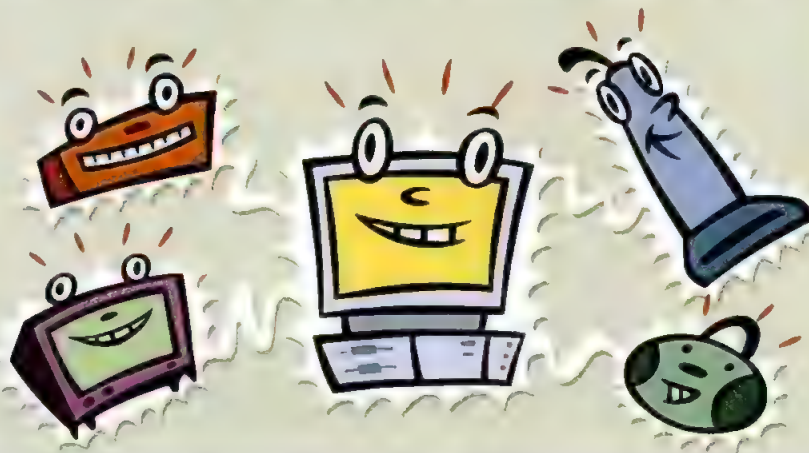
Many smaller vendors have tried to avoid the long and costly tests to gain a time-to-market advantage. Not surprisingly, the larger vendors—concerned that nonconformance could lead to serious legal problems and substantial penalties—have taken the procedures seriously. But until recently, vendors considered the lengthy process restrictive. They had to use a certified lab to test each individually marketed system and had to submit all results to the FCC for approval; each approved product required a label with a unique FCC ID number. The process was

costly and could take up to two months—a time frame that may have been acceptable ten years ago, when product cycles were 18 months long, but is untenable in view of today's three- to six-month cycles.

Last year, the FCC reacted to industry pressures by substantially redefining and streamlining the procedures. The new approach significantly reduces testing costs and lets vendors sell "self-declared" systems immediately.

Now vendors can avoid testing each system if it uses approved components. System vendors include a "Declaration of Conformity" with the product and place an FCC compliance label, without an ID number, on the main chassis. All installed components that require FCC testing must have their own FCC labels. (Note that some of the larger vendors still conduct full emissions testing, particularly if they manufacture or customize their own motherboards).

Considering the relaxed requirements, we expected to see all systems prominently displaying their new labels. We suspect that many vendors will be unable to produce a Declaration of Conformity if asked, so that's just what we intend to do. Marketing noncompliant systems indicates that a vendor doesn't respect federal laws—but also suggests that the FCC has trouble policing its regulations. The FCC has made compliance easy and expects the honor system to work. So do we. Stay tuned for our investigative results.—Nick Stam



Trends

Internet: Part 2

The research-only network Internet 2 will also yield commercial applications.

Universities and research labs won't be the only settings to benefit from the next-generation Internet, dubbed Internet 2. According to market research firm Gartner Group, the high-speed, multimedia-capable private network in development for over 100 organizations will have some commercial uses, too. Down the road, the firm predicts, the public Internet will offer "I2-like services," providing much speedier access than is currently available.

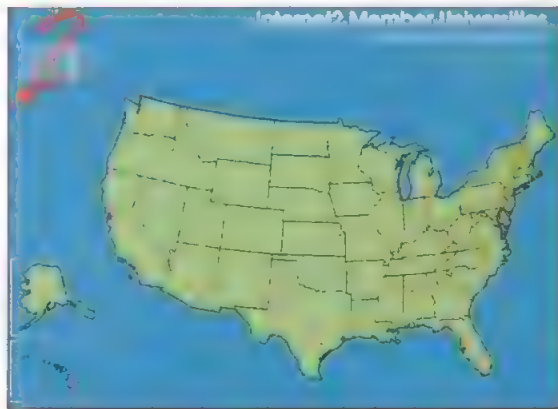
The push to incorporate technologies gleaned from Internet research and development into the public Internet is based on economics, according to Eric Paulak, senior analyst at Gartner. "In order to make any money off of the venture, the vendors that are building Internet 2—such as MCI—will need to develop commercial applications.

The key to this move will be the network connection from Internet 2 to the rest of the Internet," he says.

To that end, developers are planning to upgrade the public Internet with a new ultra-high-speed network based on a "gigaPOP"—an infrastructure that offers low-speed IP routing similar to the current model's—and on an ATM switching core that scales up to 2.4 gigabits per second. The move will increase today's network speeds tenfold, says Paulak. Gartner estimates that by the year 2002, 20 percent of the major U.S. markets will be able to offer direct access to the gigaPOP network.

Although the government and private institutions are paying for the development of Internet 2, the cost of the public Internet's upgrade—which will be upwards of several billion dollars, according to Paulak—will fall onto con-

sumers in the form of higher access charges. For that reason, Paulak predicts that a large majority of Internet service providers will turn from flat-rate pricing plans to usage-



INTERNET SEQUEL: Internet 2 has over 100 university members across the U.S., including Harvard, Princeton, and Yale.

based models. Already BBN Planet, PSINet, and UUNet are making that move.—Angela Hickman

JAKE KIRCHNER

Blow Up Your PC, Move to the Country

For years, parents have struggled to limit their children's television-viewing time. With the average child now watching TV for more than 3 hours a day, there's been a growing call to pull the plug on the boob tube.

In the last year, many in the PC industry have noted happily that children's TV viewing is declining as their Internet use is growing. But now, more and more parents are reacting with alarm to stories about porn on the Web and anything-goes chat sites. Parents are wondering whether they should—or even can—limit the kinds of Web sites and newsgroups their children visit and the amount of time the kids spend online.

In recent columns, I wrote that society's growing reliance on the Internet for communications, entertainment, and education will inevitably lead to more methods of filtering information according to individuals' needs. It also will put more pressure on governments around the world to restrict access to Internet pornography as well as other content that some people might consider harmful.

I stand with the First Amendment as it applies to news, and I believe governments should not define what is news, apply rating or labeling systems to news content on the Internet, or restrict that content. I also believe users should be free to apply whatever search agents or content filters they find useful.

But between the hands-off stance toward First Amendment-protected content and individuals' opposition to certain content lies a minefield of third-party rating systems, browsers with built-in filters, commercial site-blocking software, voluntary



adults-only restrictions for porn sites, a variety of pay-per-view sites, and the possibility of future legal restrictions. The passage of the now-defunct Communications Decency Act was just the first misstep in this minefield. There will be others.

After I warned in a recent column that "Hands off My First Amendment" bumper stickers and lapel pins will not fight off the harmful regulatory actions that are likely to arise, some readers thought I meant that I favor government regulation in this area. I don't. But far more fascinating was how many people wrote that the Internet is an adult medium and should remain so. Their arguments boiled down to this: "Children should not be allowed on the Internet; if you don't trust your children or can't monitor their activities, then you shouldn't have children or you shouldn't have Internet access in your home."

I don't believe the Internet should or can be restricted to adults. And with government agencies spending billions to get the Internet into every school, the adults-only argument will be trampled within a few years. More important, in the coming years the Internet will evolve beyond an optional medium, like a premium cable channel that you can choose to subscribe to or not. What we think of as the Internet today will become part of one "net" bringing us not just information but also telephony, video, music, and commerce of every imaginable type.

Those who say, "Don't put any restrictions on the Web but keep kids away" are, in fact, arguing for greater restrictions than I'm willing to contemplate. If we have to start limiting kids' PC usage in the way we do their TV viewing, the loss will be everyone's.

**We've contributed
several advances to
the notebook PC.**



Like inventing it.

NEC also introduced the first color laptop. The first notebook with an active matrix display and modular components. And one of the first portables with MMX™ technology. What's more, we offer the most extensive selection of notebooks available.

Our approach to direct sales is no less innovative. NEC NOW™ connects you with System Consultants who have the expertise to match the right notebook to your unique situation. And NEC NOW is backed by the resources, quality and dependability of one of the world's largest computer companies. We even



Why NEC NOW?

- The security of partnering with a company known for its technological innovations.
- The flexibility of ordering direct or through a reseller.
- The expertise of System Consultants.
- The immediate availability of competitively priced products.
- The resources of one of the world's largest computer companies.



give you the choice of working through a qualified NEC reseller partner.

So when you need a notebook PC, call the company that invented it. And reinvented direct sales.



©1997 NEC Computer Systems Division. Packard Bell, NEC, Inc., NEC, Versa, and MultiSync are registered trademarks. VersaBay, A700, C700, C500, ESM, PortBar, MiniDock, and Express5800 are trademarks, and UltraCare is a service mark of NEC Corporation, all used under license by Packard Bell NEC, Inc. Direction, VersaNote, VersaExec, and MagEye are trademarks and NEC NOW is a service mark of Packard Bell NEC, Inc. Leasing based on typical 36-month lease with purchase option. Other lease options may be available, leasing arranged by third party leasing company to qualified customers. Prices do not include shipping or applicable sales tax, are valid in the US only and are subject to change without notice. Products and specifications are subject to change without notice. * Product is 56Kbps capable. However, due to FCC rules which restrict power output of the service providers' modems, current download speeds are limited to approximately 53Kbps. Actual speed may vary depending on line conditions. MS, Intel, Mouse, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. NetWare and Novell are registered trademarks of Novell, Inc. The Intel Inside logo, LANDesk and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other trademarks and registered trademarks are property of their respective owners.

Greater availability because NEC is one of the world's largest manufacturers of TFT LCD displays.



Intel® 166MHz Pentium processor with MMX technology.

**BUILT
TO
ORDER**

12.1" SVGA active matrix with 64K colors at 800 x 600 resolution for a brighter, richer, photorealistic display.



Security features: multiple password protection, built-in docking station alarm.

VersaBay modular component technology for maximum flexibility and instant customization.

NEC Versa® 6060 Series: High performance desktop replacements.

Common Features: PCI Bus with 128-bit Graphics Accelerator • 32-bit CardBus Support • 2MB VRAM • Integrated 16-bit Stereo Sound • USB Port • VersaBay™ II Option Slot Accepts CD-ROM, Floppy Drive (both included), Optional 2nd Hard Drive and 2nd Battery • Lithium Ion Battery • DMI 2.0 Compliant • Intel LANdesk® Client Manager 3.0 • Microsoft® Windows® 95 • Upgradeable 3-Year Limited Warranty

Versa 6060

- 166MHz Pentium® processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 32MB EDO DRAM (80MB max)
- 2.1GB Hard Drive/20X max CD-ROM
- U.S. Robotics® x2" XJACK® 56Kbps* Fax Modem
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional Versa Docking Station 6000 plus, add \$899
- * Optional VersaExec™ Leather Carrying Case, add \$199
- * Upgrade to MS® Windows NT® 4.0, add \$99

\$3849

Business Lease: \$135/mo.

Versa 6060

- 166MHz Pentium processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 16MB EDO DRAM (80MB max)
- 2.1GB Hard Drive/20X max CD-ROM
- * Optional U.S. Robotics x2 XJACK 56Kbps* Fax Modem, add \$199
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional VersaPro Ballistic Nylon Carrying Case, add \$99
- * Optional Versa MiniDock™ 6000, add \$499

\$3499

Business Lease: \$126/mo.

NEC Versa 2700 Series: All-in-one convenience at a sensible price.

Common Features: PCI Bus with 128-bit Graphics Accelerator • 256KB L2 Pipeline Burst Cache • 32-bit CardBus Support • 2MB VRAM • USB Port • 56Kbps* Integrated Modem • Stereo Speakers and Subwoofer with 3D Stereo Sound • DMI 2.0 Compliant • Intel LANdesk Client Manager 3.0 • MS® Windows 95 • Bundled Microsoft Software Including MS Word 97 • Upgradeable 1-Year Limited Warranty

Versa 2760MT

- 166MHz Pentium processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 16MB EDO DRAM (96MB max)
- Built-in 1.44GB Hard Drive, 16X max CD-ROM, 1.44MB Floppy Drive, and Lithium Ion Battery
- * Upgrade to 48MB RAM, add \$299
- * Optional Lithium Ion Battery, add \$199
- * Optional Versa PortBar™ 2700 Port Replicator, add \$159
- * Optional NEC Xircom 10Base-T Network Card, add \$139

\$2999

Business Lease: \$108/mo.

Versa 2730M

- 133MHz Pentium processor with MMX technology
- 12.1" SVGA DSTN Color Display
- 16MB EDO DRAM (96MB max)
- Built-in 1.44GB Hard Drive, 16X max CD-ROM, 1.44MB Floppy Drive, and NiMH Battery
- * Upgrade to 32MB RAM, add \$159
- * Optional Lithium Ion Battery, add \$199
- * Optional VersaNote™ Ballistic Nylon Carrying Case, add \$69
- * Upgrade to a 2.1GB Hard Drive, add \$149

\$2299

Business Lease: \$83/mo.

NEC Versa 6200 Series: The ultimate power notebooks.

Common Features: 64-bit CPU and 32-bit PCI Bus Architecture • 32-bit CardBus Support • 2MB VRAM • 16-bit Stereo Sound with 3D Spatializer Technology • VersaBay II Option Slot Accepts CD-ROM, Floppy Drive (both included), Optional 2nd Hard Drive and 2nd Battery • MS Windows 95 • Lithium Ion Battery • Upgradeable 3-Year Limited Warranty

Versa 6200MX

- 13.3" XGA Active Matrix TFT Color Display
- 166MHz Pentium processor with MMX technology
- 64MB EDO DRAM (128MB max)
- 3GB Hard Drive/10X avg CD-ROM
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional U.S. Robotics x2 XJACK 56Kbps* Fax Modem, add \$199
- * Optional VersaExec™ Leather Carrying Case, add \$199
- * Optional Versa Docking Station 6000 Plus, add \$899

\$4399

Business Lease: \$154/mo.

Versa 6200MX

- 13.3" XGA Active Matrix TFT Color Display
- 166MHz Pentium processor with MMX technology
- 32MB EDO DRAM (128MB max)
- 2.1GB Hard Drive/10X avg CD-ROM
- * Upgrade to 64MB RAM, add \$299
- * Optional NEC Xircom 10Base-T Network Card, add \$139
- * Optional VersaPro Ballistic Nylon Carrying Case, add \$99
- * Optional Versa MiniDock 6000, add \$499

\$3799

Business Lease: \$133/mo.

Call now for immediate delivery from our factory or for a free catalog.

Mod-Fit Sun-Sun EST Dept. No. PM5778

1-888-8-NEC-NOW

www.necnow.com (1-888-863-2669)

NEC

NEC Direction™ PCs *A new direction in cutting-edge technology*

Common Features: Mini-Tower or Desktop Tool-Less Chassis • 24X max CD-ROM • 3.5" Floppy Drive • MS Windows® 95 • MS Office 97 SBE • 2 USB Ports • Microphone • Palmrest Keyboard and MS IntelliMouse® • 3-Year Limited Warranty with 1-Year On-Site Service • *DirecPC Satellite Dishes are Now Available as Upgrades on all Direction Systems*

Direction SPL300

- 300MHz Pentium® II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 6.4GB Ultra DMA Hard Drive, 9.5ms
- 64MB SDRAM
- Number Nine AGP Revolution, 8MB WRAM
- Altec® ACS-45 Speakers/Wavetable Audio
- U.S. Robotics 56Kbps* Data/Fax/Voice Modem
- Iomega® Zip Drive
- NEC C700 17" Monitor (16" viewable/v.i.s.)
- * Upgrade to Altec ACS-410 Speakers with ACS-251 Subwoofer, add \$69
- * Upgrade to NEC MultiSync® A700™ 17" Monitor (15.6" v.i.s.), add \$229

\$3499

Business Lease: \$126/mo.

Direction SPL300

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 7.0GB Ultra DMA Hard Drive
- 64MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Wavetable Audio
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to Number Nine AGP Revolution 3D, 4MB WRAM, add \$219
- * Upgrade to Iomega Zip Drive, add \$99

\$2949

Business Lease: \$106/mo

Direction SPL233

- 300MHz Pentium® II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- U.S. Robotics 56Kbps* Data/Fax/Voice Modem
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to 7.0GB Hard Drive, add \$109
- * Upgrade to Number Nine AGP Revolution 3D, 4MB WRAM, add \$219

\$2199

Business Lease: \$79/mo.

Direction SPL266

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX Chip Set
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to Wavetable Audio, add \$49
- * Upgrade to NEC C700 17" Monitor (16" v.i.s.), add \$199

\$2329

Business Lease: \$84/mo

NEC Express5800™ Series Servers *Servers that grow with your business.*

Common Features: Integrated PCI Wide Ultra SCSI Disk Controller • Integrated PCI SCSI Controller for Media Bays • Integrated SVGA Controller • 1MB VRAM (upgradeable to 2MB) • 12X CD-ROM • 3.5" Floppy Drive • Mouse and Keyboard • NEC ESM™ Pro Server Management Software • MS Windows NT Server 4.0 and NetWare® 4.11 Certified • 3-Year On-Site Service Warranty

Express5800 LE2200

- Dual Capable Pentium II System w/one 266MHz Pentium II processor/512KB Integrated L2 Cache
- 64MB ECC DIMM Memory (512MB Maximum)
- One 4.3GB Ultra Wide SCSI Disk
- 8 Expansion Slots, 4 PCI, 3 ISA, 1 Shared
- 7 Drive Bays, 3 External 5.25", 4 Internal 3.5"
- * Optional Second 266MHz/512KB Pentium II processor, add \$1099
- * Additional 64MB of ECC Memory, add \$449
- * Optional PCI Ultra Wide SCSI RAID Controller, add \$1349
- * 2/4/9GB Ultra Wide SCSI Disk Drives for up to 36GB of Storage Space, add \$529/\$849/\$1299
- * Optional MS Windows NT Server 4.0, add \$799

\$3959

Business Lease: \$139/mo.

Express5800 LE2000

- Dual Capable Pentium Pro System w/one 200MHz Pentium Pro processor/256KB Integrated L2 Cache
- 32MB ECC DIMM Memory (1GB Maximum)
- One 2.1GB Ultra Wide SCSI Disk
- 8 Expansion Slots, 4 PCI, 3 ISA, 1 Shared
- 7 Drive Bays, 3 External 5.25", 4 Internal 3.5"
- * Optional Second 200MHz/256KB Pentium Pro processor, add \$799
- * Additional 32MB of ECC Memory, add \$189
- * Optional PCI Ultra Wide SCSI RAID Controller, add \$1349
- * 2/4/9GB Ultra Wide SCSI Disk Drives for up to 36GB of Storage Space, add \$529/\$849/\$1299
- * Optional MS Windows NT Server 4.0, add \$799

\$2699

Business Lease: \$97/mo.



Call now for immediate delivery from our factory or for a free catalog.

Mon-Fri 9am-5pm EST (Reg. No. PM577)

1-888-8-NEC-NOW

www.necnow.com (1-888-863-2669)

©1997 NEC ELECTRONICS CORPORATION

NEC

NOTEBOOKS

MMX Powered Up

Using its new 0.25 μ manufacturing process, Intel is offering the highest mobile clock speeds to date—200- and 233-MHz Pentium MMX—from a chip that is smaller, cooler, and consumes less power than its predecessors. In addition to the eight household names covered in our feature roundup, three other manufacturers have designed 233-MHz mobile systems.

Acer America Corp. (800-558-2237, www.acer.com) has updated its **TravelMate 7100** notebook line to include two Tillamook systems. (TravelMate portables were originally sold by Texas Instruments, whose mobile computing business was acquired by Acer earlier this year.) Both the 200- and 233-MHz TravelMate 7100 models support up to 128MB of EDO DRAM memory and ship standard with either 32MB or 48MB of RAM and a 3.2GB hard disk. The 7100-200 system with 32MB of RAM is priced at \$5,200 (street); stepping up to 48MB of RAM brings the cost to \$5,500 (street).

Like most high-end notebooks, the TravelMate 7100 series has upgraded to 512K of secondary cache. A 128-bit NeoMagic graphics chip set, equipped with 2MB of VRAM, drives the machine's 12.1-inch active-matrix display. The TravelMate has a modular bay that accepts either a 14X CD-ROM or a 1.44MB floppy disk drive. On the exterior, there's a touch pad pointing device, a USB port, a Fast IR port, dual speakers backed internally by 16-bit stereo sound, and a PC Card bay with CardBus and Zoomed Video support.

According to Acer, the machine's lithium ion battery offers up to 7 hours of battery life.

Though its actual battery life is likely to be a bit more modest, the Tillamook processor—which has a 1.8-volt core and a 2.5-volt I/O interface (for its mobile Pentium predecessor, these figures were 2.45 and 3.3 volts, respectively)—consumes relatively little power and thus allows for battery lives that were previously unattainable.

The 7100 series ships



MORE POWER TO GO: 200- and 233-MHz Pentium MMX notebooks from Hitachi (above right), Power Computing (above), and Acer (below).

standard with Microsoft Windows 95, but it's also NT-certified; NT can be preinstalled with Acer's NT enhancement kit (pricing on the kit has yet to be set).

Acer backs each TravelMate with a three-year parts-and-labor warranty. A DockMate III docking station, which integrates 10BaseT Ethernet, sells separately at \$300 (street).

The Hitachi PC Corp., a relatively new presence in the North American notebook sales market, is offering the 200-MHz **VisionBook Elite** lightweight portable and the 233-MHz **VisionBook Pro** power notebook (800-555-6820, www.hitachipc.com).

The VisionBook Pro, whose dimensions (1.7 inches thick, 7.9 pounds) are typical for its class, offers a full 13.3-inch XGA active-matrix display. It ships with a modular 20X Toshiba CD-ROM drive, which can be swapped for a standard floppy disk drive, and a Hitachi-manufactured hard disk available in sizes up to 4.5GB. The core com-



ponents resemble those of past VisionBook Pro models: 32MB of EDO memory, 512K of L2 cache, the 430TX chip set, and a Chips and Technologies graphics chip set with 2MB of VRAM. The VisionBook Pro starts at \$4,600 (street).

The VisionBook Elite is a smaller, lighter machine—measuring only 1.4 inches from top to bottom and weighing only 5.2 pounds. Though it opts for the 200-MHz version of the Tillamook processor, it—like the VisionBook Pro—incorporates a 13.3-inch XGA active-matrix display, 16MB of EDO RAM (expandable to 80MB), a 3.2GB hard disk, a 20X Toshiba



RECAP We reviewed notebooks in *First Looks*, October 7, 1997. The Editors' Choices were the

- IBM ThinkPad 770
- Micron TransPort XKE

In the August 1997 story "Portable Desktops" they were the

- Gateway Solo 9100 SE-166
- Micron TransPort XKE
- Dell Latitude LM M166ST
- Gateway Solo 2200 S5-133
- IBM ThinkPad 560E

CD-ROM, 512K of L2 cache, the 430TX chip set, and a Chips and Technologies graphics chip set with 2MB of VRAM.

On the heels of Microsoft's investment in Apple come the first Wintel notebooks from the industry's leading direct marketer of Macintosh clones: Power Computing's **PowerTrip** line of Tillamook notebooks (800-527-0642, www.powercc.com). The PowerTrip 200, a 200-MHz Tillamook machine that starts at \$3,299, offers either a 2.1GB or 4GB hard disk, 32MB of RAM (expandable to 128MB), a floppy disk drive, and a 20X CD-ROM drive in a 2-inch-high, 7.7-pound chassis. The system is available with either a 12.1-inch SVGA or a 13.3-inch XGA display. Its Trident Cyber 9397 graphics chip set incorporates 4MB of synchronous graphics RAM. Pricing starts at \$3,299.

The system's slate gray chassis is outfitted with a Windows 95 keyboard, a touch pad, a USB port, a video-out port, two stereo speakers, a microphone, and a PC Card bay that supports CardBus and Zoomed Video. An internal 56-Kbps modem is included.

The PowerTrip 233 is a similarly designed and configured machine, with pricing starting at \$4,999. Power Computing ships both models with a one-year parts-and-labor warranty (which can be extended to three years for \$150), McAfee VirusScan, Microsoft Windows 95 (Windows NT is available for an additional \$149), Intuit's Quicken, and a nylon case.—Cade Metz

IMAGE EDITING

Getting the Balance Right

Snapping the photo is only half the challenge. Transforming the photo into the image you had originally hoped to capture—or into an entirely new image you never imagined—is the other half. Helping you along are the latest upgrades to popular consumer image-editing packages from Adobe Systems (800-888-6293, www.adobe.com) and Microsoft Corp. (800-462-9400, www.microsoft.com). Both programs are project-based: not only does the software let you enhance your photos, but it also helps you use your photos in fun and creative ways.

Taking a giant leap forward is Adobe PhotoDeluxe 2.0 (\$40 street). Available for both Windows 95 and the Macintosh, PhotoDeluxe 2.0 has been revamped from the inside out. The underlying technology powering PhotoDeluxe may be based on Adobe's high-end Photoshop software, but after one look at the interface there's no mistaking the consumer audience that PhotoDeluxe is intended for. Streamlined and vastly improved, the tabbed interface has been redesigned so that Photo-

elements. You can also add any of up to 30 special effects. Once your image is ready, you may proceed to Cards & More for guided activities that take you through the process of creating greeting cards, calen-



dars, business cards, sports cards, photo album pages, cassette labels, frames, and more. The Internet section provides a direct link to Adobe Connectables, a special Web site that will offer additional guided activities from Adobe. When you're finished with your image, you can send photos via disk or e-mail cards. You can even create a screen

saver or slide show.

For those who consider themselves past the training-wheels stage, the final section—Advanced—offers direct access to all tools at any given point in a project. It also provides full freedom to work on each section in any order you choose.

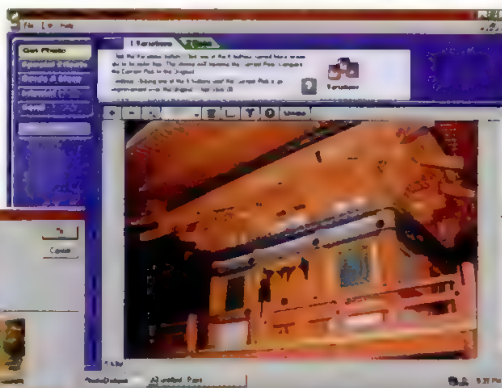
Among the new tools featured in PhotoDeluxe are an intelligent, one-step red-eye removal tool; Adobe Smart-Select, an edge-detection tool that lets you trace and cut out elements from within your image; and the Clone Tool, which removes, covers, and duplicates specific photo elements within a given picture.

Also moving to the next level is Microsoft's Picture It! 2.0 (\$50 street). Picture It! 2.0 offers an improved interface that makes it easier to locate the right tools for the task you'd like to accomplish. The convenient new cataloguing

or collage in only a few steps. Or you can strike out on your own, creating projects from scratch. Projects in this package include calendars, collages, flyers, and e-mail postcards.

The adept image editor, which previously fixed such problems as red-eye and exposure automatically and traced out an object from one photo in order to add it to another, now adds the ability to distort photos in the same manner as MetaCreation's popular Kai's Power Goo. You can also remove dust and scratches from old photos and do freehand painting with a variety of brushes. There are more than 500 design templates and backgrounds to choose from, as well as a variety of special effects and the ability to enhance your text with bends, shadows, and gradient fills.

Picture It! will work with Microsoft's Greetings Workshop, so you can transfer your images into Greetings Workshop cards automatically. In addition, Picture It! links to Kodak's Picture Network for online image sharing and archiving.—Melissa J. Perenson



PICTURE PERFECT: Adobe PhotoDeluxe 2.0 (above) lets you select the best coloring; Microsoft's Picture It! 2.0 (lower left).

feature logs images of photos on your hard disk, Zip drives, and other removable media and stores thumbnails of those images on your hard disk; you can later search for the photos you've worked on within Picture It!

If you want to satisfy your creative urges, you can use Picture It!'s wizards and templates, which will guide you through the design process of making a greeting card

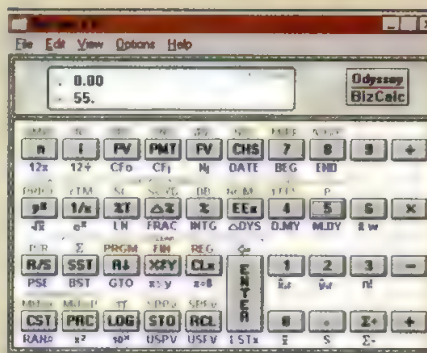
UTILITIES

Calculate It

Looking for a multipurpose calculator for your PC that's suitable for scientific, business, and financial calculations? Odyssey Computing's BizCalc for Windows 95 (\$45 street) is a full-featured calculator that emulates Hewlett-Packard's industry-standard HP-12C calculator (800-965-7224, www.odysseyinc.com).

Using reverse Polish notation logic—which doesn't require an

"=" key—you can do specialized calculations for mortgages, loans, leasing, compound interest, depreciation and amortization, and more. A tape display tracks your calculation entries, so you can easily retrace your every step.—MJP



Deluxe's more than 50 guided activities have each been condensed into a process requiring six steps or less.

First, you will get your photo by acquiring images from a TWAIN source or file. You can then perform routine operations such as instant fix, red-eye removal, retouching, and removing

We're Bustin' Loose...



GATEWAY2000

"You've got a friend in the business."

...And Ridin' Herd Over the Competition!

When it comes to delivering more for less, stopping the folks at Gateway 2000 is about like heading off a stampede with a motor scooter.

So when component prices started to dive, we cut prices lower than a rattler's belly in a wagon rut. But we reckon that's just the beginning. Gateway field hands also amble around the world, looking for great value and working with component manufacturers to corral fresh technology. On top of that, we've created five broad product lines to meet our customer's diverse needs.

We mean business with our **E-Series** desktops and servers designed for corporate customers. **Gateway Solo™** portable PCs deliver mobile computing power, modularity and flexibility. The **Destination™ Big Screen PC/TV** rules group computing. The **Millennium™** handles small office/home office needs. And classic Gateway multimedia value is what the **Legacy™** is all about.

*Gateway offers a complete line of systems
featuring Intel Pentium® processors.*

Quality And Service Wear Our Brand

If you see the Gateway mark branded into the hide of anything, you know it's been tested more times than a bull rider in August and backed by customer service pros who know the business end of a chip set.

To help keep you in the computing saddle, we back all our systems with limited warranties. Call or write for free copies. And once you join the Gateway customer family, you'll have a technical support friend just a toll-free phone call away, 24 hours a day.

Highest Brand Loyalty, Bar None

No wonder an IDC/ACNielsen survey of computer owners showed Gateway had the highest brand loyalty of any computer maker in the U.S. home market, even better than those guys with the fruit logo*.

Give Gateway a holler today and get in on the stampede of value. We'll be glad to cut one from the herd and deliver it to your door.

*Based on percentage of computer owners planning to buy another computer of the same brand as they currently own between 11/1/96 and 7/31/97.



800-846-7062

www.gateway.com

Prairie Value, City Savvy

Experience from Gateway's own amazing growth from zero to \$5 billion in 11 years and ideas from our customers, sales groups and manufacturing teams led to our GATEWAY™ E-Series desktops and Gateway Solo portable PCs.

The E-Series line is built for business with DMI-compliant PCs and stable platforms so you can standardize and then manage upgrades when it makes sense for your particular outfit. Fault-tolerant features such as N+1 redundant power supplies, multi-drive RAID support and error-correcting memory help our servers safeguard your data.

And, if anything goes wrong, our team of highly trained, dedicated technical support pros are standing by around the clock just in case you need the digital cavalry.

Gateway Solo Portables are thundering through the mobile computing world, leaving blue ribbons and trophies in their wake.

We designed our flagship Gateway Solo 9100 portable around one priority: features. The result is a portable loaded for bear with features normally found only in desktop PCs.

If you're looking for a more classic mobile PC, the 2300 line delivers plenty of power and performance. We've also built in common modularity so you can swap many components between the 9100 and 2300.

Whether for corporate headquarters or the professional road warrior, call us for a system that can take care of business.

Gateway E-Series PCs

- Intel Pentium®, Pentium® Pro or Pentium® II Processors
- High-Performance SCSI, EIDE or Ultra ATA Hard Drives
- 2-D and 2-D/3-D Video Adapters
- Pre-installed High-Bandwidth Network Options
- E-Series Low Profile, Desktop or Mid-Tower Case
- Pre-loaded with Microsoft® Windows® 95 or Windows NT® Workstation 4.0
- Hardware Management Features
- Desktop Management Interface (DMI) 1.1 Compliant
- Gateway Gold™ Service and Support for E-Series PCs**

Prices starting at **\$979** (Quantity 1)

**E-Series PCs are covered by a three-year limited warranty. Service varies by product. Call or write for details and a free copy of our limited warranty.

Gateway Servers

- Intel Pentium Pro or Pentium II Processors
- A Full Range of Solutions with up to 6-way Processor Support
- Pre-installed High-Bandwidth Network Options
- InforManager™ Subsystem for Server Management
- Variety of High Performance Storage Solutions Including Hot-Swappable Internal RAID

Prices starting at **\$2499** (Quantity 1)



Gateway E-3100 PC

Gateway E-3000 PC

Gateway E-1000 PC

Gateway Solo™ Portable PCs

2300SE

- 12.1" SVGA DSTN Color Display
- Intel® 133MHz Pentium Processor
- 16MB EDO DRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- 128-Bit Graphics Accelerator w/ 64K Colors
- Modular 6X min/11X max CD-ROM Drive
- Modular 3.5" Diskette Drive
- USB Ports & Zoomed Video
- NTSC/PAL Video Output
- 2GB Hard Drive
- 16-Bit Sound & Stereo Speakers
- NiMH Battery & AC Pack
- 85-Key MS® Windows 95 Keyboard
- EZ Pad® Pointing Device
- Casual Carrying Case
- MS Windows 95
- MS Works 95
- Gateway Gold™ Service & Support for Portable PCs

\$2149 As low as* \$75/mo.

2300LS

- 12.1" SVGA TFT Color Display
- Intel 150MHz Pentium® Processor with MMX™ Technology
- 32MB SDRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- 128-Bit Graphics Accelerator w/ 64K Colors
- Modular 6X min/11X max CD-ROM Drive
- Modular 3.5" Diskette Drive
- USB Ports & Zoomed Video
- NTSC/PAL Video Output
- 3GB Hard Drive
- 16-Bit Wavetable Sound & Stereo Speakers
- PCMCIA 33.6 Data**/14.4 Fax Modem
- 12-Cell Li-Ion Battery & AC Pack
- 85-Key MS Windows 95 Keyboard
- EZ Pad Pointing Device
- Casual Carrying Case
- MS Windows 95 & MS Office 97, Small Business Edition plus Encarta® 97
- Gateway Gold Service & Support for Portable PCs

\$3849 As low as* \$134/mo.

9100XL BEST BUY

- ▶ 13.3" XGA TFT Color Display
- Intel 233MHz Pentium Processor with MMX Technology
- 64MB SDRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- ▶ 4MB EDO Video RAM (1280 x 1024 external)
- ▶ Removable Combo 6X min/11X max CD-ROM & 3.5" Diskette Drive
- USB Ports & Zoomed Video
- NTSC/PAL Video Input & Output
- 5GB Hard Drive
- 16-Bit Wavetable Sound & Stereo Speakers
- PCMCIA Modem with x2™ Technology**
- Two 12-Cell Lithium Ion Batteries & AC Pack
- 88-Key MS Windows 95 Keyboard
- EZ Pad Pointing Device
- Executive Carrying Case
- Gateway Solo Mini Docking Station
- MS Windows 95 & MS Office 97, Small Business Edition plus Encarta 97
- Gateway Gold Service & Support for Portable PCs

\$5899 As low as* \$205/mo.



800-846-7002

www.gateway.com

Gateway Solo Portable PCs For The Road

Value Bigger Than All Outdoors

Computing in the den, family room, small office — no matter where you need a PC, Gateway can fill the bill.

GATEWAY™ Destination Big Screen PC/TVs

The Destination system pioneered group computing thanks to a 31-inch monitor, wireless keyboard and Field Mouse remote. With the heart of a computer and options like the **Pentium® II** processor and DVD-ROM drive, the Destination system can do anything a PC can do. With a click of the mouse button, it can also do anything a conventional television can do.

Gateway G-Series and GP-Series

No sense making things complicated. Give customers fresh technology at great prices. Sticking to that philosophy has built Gateway into what it is today.

The G-Series is classic Gateway: Find out what customers want, go find it and offer it at prices people can afford. That means the latest multimedia, including MMX technology across the line and the new digital boss, DVD. Fresh technology at great prices. The philosophy has made Gateway a force in the home market.

The GP-Series delivers that same fresh technology to the small office/home office. Options like Intel's **Pentium II** processors, massive storage and productivity software let one GP-Series PC do many things.

Gateway Destination™

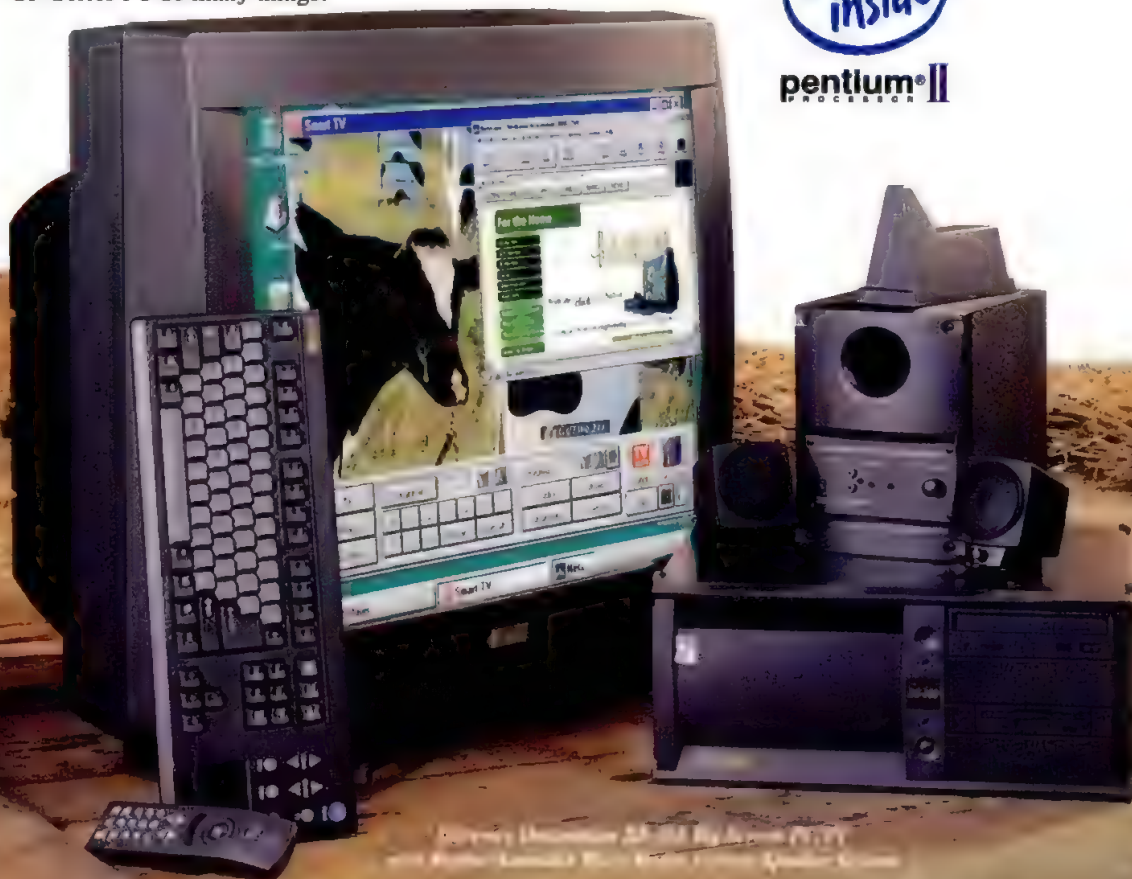
Big Screen PC/TV_____

D6-300XL

- Intel® 300MHz Pentium® II Processor with 512K Cache
- 64MB EDO DRAM
- Destination 31" VGA Monitor
- 2MB Graphics Accelerator w/ Cable-Ready TV Tuner
- PowerVR 3-D Graphics Accelerator
- 8GB 8.5ms Ultra ATA Hard Drive
- ▶ DVD-ROM Drive & DVD Decoder Card
- 3.5" Diskette Drive
- Ensoniq® Wavetable Audio
- ▶ harman/kardon® High-Fidelity Sound System
- TelePath® Modem for Windows with x2™ Technology**
- 7-Bay Charcoal-Colored PC Case
- Wireless Keyboard w/ Integrated EZ Pad® Pointing Device
- Wireless Field Mouse® Remote
- Microsoft® Windows® 95
- Home Software Titles
- Gateway Gold™ Service & Support* for Big Screen PC/TVs

\$4599 As low as *\$160/mo.

*The Destination 31-inch monitor is covered by a one-year limited warranty. Call or write for a free copy.



Gateway GP-Series PCs for the Office Professional

GP5-166

- Intel 166MHz Pentium® Processor with MMX™ Technology
- 32MB DRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 2GB 11ms Ultra ATA Hard Drive
- 12X min/16X max CD-ROM & 3.5" Diskette Drives
- GP-Series Desktop Case
- 104* Keyboard & MS® IntelliMouse™
- MS Windows 95 & MS Office 97, Small Business Edition plus Encarta® 97
- Gateway Gold Service & Support for GP-Series PCs

\$1449 Business Lease* \$54/mo.

GP6-266 BEST BUY

- Intel 266MHz Pentium II Processor with 512K Cache
- 64MB DRAM
- ▶ EV900 .26 Screen Pitch 19" Monitor (18" viewable)
- 4MB 3-D 64-Bit Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM & 3.5" Diskette Drives
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95 & MS Office 97, Small Business Edition plus Encarta 97
- Gateway Gold Service & Support for GP-Series PCs

\$2899 Business Lease* \$107/mo.

Gateway G-Series Multimedia PCs for the Home

G5-166

- Intel 166MHz Pentium Processor with MMX Technology
- 16MB DRAM
- 512K Pipelined Burst Cache
- EV500 .28 Screen Pitch 15" Monitor (13.9" viewable)
- 2MB 3-D 64-Bit PCI Graphics
- 1.6GB 12ms Ultra ATA Hard Drive
- 12X min/16X max CD-ROM & 3.5" Diskette Drives
- Ensoniq Wavetable Audio
- Altec™ Lansing ACS-41 Speakers
- TelePath Modem for Windows with x2 Technology™
- G-Series Desktop Case
- 104* Keyboard & MS Mouse
- MS Windows 95 & Home Software Bundle
- ▶ Color Bubble Jet Printer
- Gateway Gold Service & Support for G-Series PCs

\$1499 As low as* \$52/mo.

Please see back page for
more configurations.

G6-300

- Intel 300MHz Pentium II Processor with 512K Cache
- 64MB DRAM
- ▶ EV900 .26 Screen Pitch 19" Monitor (18" viewable)
- 4MB 3-D 64-Bit Graphics
- TV/FM Tuner Card
- 8GB 8.5ms Ultra ATA Hard Drive
- ▶ DVD-ROM Drive & DVD Decoder Card
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- ▶ Boston Acoustics® MicroMedia™ 3-Piece Speaker System
- TelePath Modem for Windows with x2 Technology™
- G-Series Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95
- Home Software Titles
- MMX Technology-Enhanced Software
- Gateway Gold Service & Support for G-Series PCs

\$3799 As low as* \$132/mo.

GATEWAY2000
EASYPAY
LOW MONTHLY PAYMENTS
Call for details about how you
can receive Quicken® Deluxe 6.0.



GATEWAY2000

800-846-7062

www.gateway.com

Gateway G-Series and GP-Series PCs for the Home and Office

Barn Burnin' Values

Get more for your money with GATEWAY 2000® PCs!

Gateway G-Series Multimedia PC

DP-266 BEST BUY

- Intel® 266MHz Pentium® II Processor with 512K Cache
- 64MB DRAM
- ▶ EV900 .26 Screen Pitch
- 19" Monitor (18" viewable)
- 4MB 3-D 64-Bit Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM & 3.5" Diskette Drives
- Ensoniq® Wavetable Audio
- ▶ Boston Acoustics® MicroMedia™
- 3-Piece Speaker System
- TelePath® Modem for Windows,
- with x2™ Technology™
- G-Series Mid-Tower Case
- 104* Keyboard & Microsoft® IntelliMouse™
- MS® Windows® 95
- Home Software Titles
- MMX™ Technology-Enhanced Software
- Gateway Gold™ Service & Support for G-Series PCs

\$2999 As low as* \$104/mo.

Gateway Destination™ Big Screen PC/TV

DS-200 BEST BUY

- Intel 200MHz Pentium® Processor with MMX Technology
- 32MB SDRAM
- 512K Pipelined Burst Cache
- Destination 31" VGA Monitor
- 2MB Graphics Accelerator with Cable-Ready TV Tuner
- 4GB 11ms Ultra ATA Hard Drive
- ▶ DVD-ROM Drive & DVD Decoder Card
- 3.5" Diskette Drive
- Ensoniq Wavetable Audio
- ▶ Boston Acoustics MicroMedia
- 3-Piece Speaker System
- TelePath Modem for Windows with x2 Technology™
- 7-Bay Charcoal-Colored PC Case
- Wireless Keyboard w/ Integrated
- EZ Pad® Pointing Device
- Wireless Field Mouse® Remote
- MS Windows 95
- Home Software Titles
- Gateway Gold Service & Support*
- for Big Screen PC/TVs

\$2999 As low as* \$104/mo.

Gateway GP-Series Professional PC

GP6-266 BEST BUY

- Intel 266MHz Pentium II Processor with 512K Cache
- 64MB DRAM
- ▶ EV900 .26 Screen Pitch
- 19" Monitor (18" viewable)
- 4MB 3-D 64-Bit Graphics
- 6.4GB 10ms Ultra ATA Hard Drive
- 12X min/24X max CD-ROM & 3.5" Diskette Drives
- GP-Series Mid-Tower Case
- 104* Keyboard & MS IntelliMouse
- MS Windows 95
- MS Office 97, Small Business Edition
- plus Encarta® 97
- Gateway Gold Service & Support for GP-Series PCs

\$2899 Business Lease* \$107/mo.

Please call for other configurations.
We custom build each GATEWAY 2000®
system to your specifications.

Gateway Solo™ Portable PC

9100XL BEST BUY

- ▶ 13.3" XGA TFT Color Display
- Intel 233MHz Pentium Processor with MMX Technology
- 64MB SDRAM (expandable to 192MB)
- 256K Pipelined Burst Cache
- ▶ 4MB EDO Video RAM (1280 x 1024 external)
- ▶ Removable Combo 6X min/11X max
- CD-ROM & 3.5" Diskette Drive
- USB Ports & Zoomed Video
- NTSC/PAL Video Input & Output
- 5GB Hard Drive
- Premium 16-Bit Wavetable Sound & Stereo Speakers
- PCMCIA Modem with x2 Technology™
- Two 12-Cell Lithium Ion Batteries & AC Pack
- 88-Key MS Windows 95 Keyboard
- EZ Pad Pointing Device
- Executive Carrying Case
- Gateway Solo Mini Docking Station
- MS Windows 95
- MS Office 97, Small Business Edition plus Encarta 97
- Gateway Gold Service & Support for Portable PCs

\$5899 As low as* \$205/mo.

GSA Schedule # GS-35F-4565G



Toll Free from Canada
800-846-3609



Toll Free from Puerto Rico
800-846-3613



8 0 0 - 8 4 6 - 7 0 6 2

www.gateway.com

610 Gateway Drive • P.O. Box 2000 • N. Sioux City, SD 57049-2000 • Phone 605-232-2000
TDD 800-846-1778 • Fax 605-232-2023 • FaxBack® 800-846-4526 • International FaxBack Access 605-232-2561
Component Add-On Sales 800-846-2080 • Sales Hours: 7am-10pm Weekdays, 8am-8pm Saturdays & Sundays (CT)



pentium® II

© 1997 Gateway 2000, Inc. GATEWAY 2000, black-and-white spot design, CrystalScan, EZ Pad, Field Mouse, "G" logo, TelePath and "You've got a friend in the business." slogan are registered trademarks, and Destination, GATEWAY, Gateway Gold, Kid's Backpack and Gateway Solo are trademarks of Gateway 2000, Inc. Not all Gateway E-Series PCs, NS Series servers Destination systems, G-Series PCs and GP-Series PCs contain the Pentium II processor. The Gateway Solo PC does not contain the Pentium II processor. The Intel Inside Logo, Intel, IMM and Pentium are registered trademarks, and MMX is a trademark of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. All prices and configurations are subject to change without notice or obligation. Prices do not include shipping or applicable sales tax. Many Gateway 2000 products are custom engineered to Gateway 2000 specifications, which may vary from the retail versions of the software and/or hardware in functionality, performance or compatibility. *Financing available on approved credit issued and administered by MBNA America® Bank, N.A. Payments based on 36-month term at an Annual Percentage Rate as low as 14.9%. *Leasing arranged by independent leasing companies to qualified commercial customers. Lease payments based on 36-month term. Lease terms subject to change without notice or obligation.

Upgrades

Sold only with the purchase of a system.

Desktop Upgrades

- DVD-ROM, DVD Decoder Board and DVD Media Sampler \$419
- Boston Acoustics® MicroMedia™ 3-Piece Speaker System (upgrade from PCs that include Altec™ Lansing ACS-41 Speakers) \$75
- Iomega® Internal ZIP™ 100MB Drive \$99 (includes two 100MB cartridges)
- TR4 IDE 4GB Tape Backup Unit \$199
- MS® Windows NT® 4.0 Upgrade \$99 (upgrade from PCs that include MS Windows® 95)

Portable PC Upgrades

- Gateway Solo™ Mini Docking Station \$199
- Gateway Solo Docking Station \$599
- PCMCIA 33.6 Data/14.4 Fax Modem™ \$200
- Extra 2300/9100 12-Cell Lithium Ion Battery \$200

**Maximum data transfer rate dependent on certain variables including particular modems with which you are communicating, telephone lines, communications software and communications protocols

Destination™ Big Screen PC/TV Upgrades

- harman/kardon® High-Fidelity Sound System
Seven-piece Dolby Pro Logic® Surround Sound system including AVR-10 audio/video receiver with remote, subwoofer, center channel, and four satellites.
(Upgrade from Boston Acoustics MicroMedia 3-Piece Speaker System) \$400
- EasyPhoto Drive™ Photo Scanner Upgrade \$149
- Destination 31-Inch VGA Color Monitor \$999 (Call for details.)

Service & Support for Desktop Systems

GATEWAY GOLD™ PREMIUM

Extended Three-Year On-Site Agreement** including priority 800 number for access to technical experts.

- At time of system purchase \$99
- Within current on-site service agreement \$129

For our complete line of software and peripherals call GATEWAY™ component add-on sales at 800-846-2080.
Sales Hours: 7am-10pm Weekdays (CT).

**On-site service for parts replacement is available to most locations in the continental United States, Alaska, Hawaii, Puerto Rico and Canada after you and your Gateway technician determine an on-site visit is necessary. On-site service is provided by PC Technology Services, Inc. On-site is not available for any monitor, mouse, keyboard, E-1000 PC, or portable system. Write or call for a free copy of the on-site service agreement.

Extras

SOFTWARE, PERIPHERALS & SERVICES
FOR GATEWAY DESKTOP SYSTEMS

GATEWAY SELECT

Our Gateway Select program lets you know you're getting software that meets or exceeds our standards for quality, value and ease of use.

Software

- **Games & Entertainment Pack II** Includes Bug!™; DeadLock™; MechWarrior® 2: Mercenaries™; 9™; PitFall: The Mayan Adventure®; SPQR: The Empire's Darkest Hour™; and PC ProPad gaming device. \$99
- **Finance Pack II (U.S. Shipment Only)** Includes Quicken® Deluxe 6; Quicken Financial Planner™ 2; Quicken Family Lawyer™ 7; and Quicken Parents' Guide to Money™. \$69
- **Kid's BackPack™ IV** Includes Math Blaster®: In Search Of Spot; Freddy Fish™ And The Case Of The Missing Kelp Seeds™; Pajama Sam™ In "No Need To Hide When It's Dark Outside™"; Just Me And My Mom™; and Muppet Treasure Island™. \$59
- **Education Bundle Grades K-3** Includes Ultimate Children's Encyclopedia™; Reader Rabbit® 1; Math Rabbit®; Interactive Math Journey®; Reader Rabbit's Interactive Reading Journey® 1; Paint, Write, Play!™; Let's Start Learning!™ and cow-spotted binder. \$99
- **Education Bundle Grades 4-8** Includes Super Solvers® Gizmos & Gadgets!®; Super Solvers OutNumbered!®; Student Writing Center®; Logic Quest™; The Oregon Trail®; Ultimate Writing & Creativity Center® and cow-spotted binder. \$99

Extras

- Kensington Masterlock \$39
- Microsoft® SideWinder™ Joystick \$59
- APC® Back-UPS® Office \$169
- PalmPilot™ Personal Data Organizer \$299
- Hewlett®-Packard ScanJet 5Pse Color Scanner \$299
- APC 650 Pro UPS \$329
- Epson® PhotoPC™ 500 Digital Camera \$499

Printers (Each printer includes cable and ink cartridge.)

- Epson Stylus® Color 400 Ink Jet Printer \$199
- Hewlett-Packard DeskJet 820Cse Color Printer \$249
- Epson Stylus Color 600 Ink Jet Printer \$299
- Hewlett-Packard DeskJet 694C Color Printer \$299
- Hewlett-Packard LaserJet 6Lse Laser Printer \$399
- Hewlett-Packard LaserJet 6Pse Laser Printer \$799



8 0 0 - 8 4 6 - 7 0 6 2

www.gateway.com



Toll Free from Canada
800-846-3609



Toll Free from Puerto Rico
800-846-3613

610 Gateway Drive • P.O. Box 2000 • N. Sioux City, SD 57049-2000 • Phone 605-232-2000
TDD 800-846-1778 • Fax 605-232-2023 • FaxBack® 800-846-4526 • International FaxBack Access 605-232-2561
Component Add-On Sales 800-846-2080 • Sales Hours: 7am-10pm Weekdays, 8am-8pm Saturdays & Sundays (CT)

© 1997 Gateway 2000, Inc. GATEWAY 2000, black-and-white spot design, EZ Pad, Field Mouse, "G" logo, TelePath and "You've got a friend in the business" slogan are registered trademarks, and Destination, GATEWAY, Gateway Gold, Kid's BackPack and Gateway Solo are trademarks of Gateway 2000, Inc. Not all Gateway E-Series PCs, Destination systems, G-Series computers and GP-Series PCs contain the Pentium II processor. Gateway Solo PCs do not contain the Pentium II processor. The Intel Inside Logo, Intel, IMM and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other brands and product names are trademarks or registered trademarks of their respective companies. All prices and configurations are subject to change without notice or obligation. Prices do not include shipping or applicable sales tax. Many Gateway 2000 products are custom engineered to Gateway 2000 specifications, which may vary from the retail versions of the software and/or hardware in functionality, performance or compatibility. *Financing available on approved credit issued and administered by MBNA America® Bank, N.A. Payments based on 36-month term at an Annual Percentage Rate as low as 14.9%. *Leasing arranged by independent leasing companies to qualified commercial customers. Lease payments based on 36-month term. Lease terms subject to change without notice or obligation.

Trends Peripherals

SPEAKERS

Three-Piece Orchestras

Though the speakers that came with your PC are fine for producing high-pitched error beeps, you'll need a little more bang to get the most from a multimedia computer. For full enjoyment of audio and multimedia CDs, a three-part system of two satellite speakers and a subwoofer is a must-have upgrade.

Altec Lansing Technologies (800-258-3288, www.altecomm.com) offers a technological breakthrough with the first three-piece USB speaker system: the **USB46 PowerCube** (\$130 street). Equipped with SmartSpeaker Technology for increased sound clarity, the system has two speakers and a 20-watt subwoofer. The USB46 also includes control software that lets you make all sound adjustments on-screen.

If you're not ready for USB,



Altec Lansing also has the more conventional **ACS48 PowerCube Plus** (\$150 street). This sound system has a booming 40-watt subwoofer and two satellite speakers that pump out 20 watts each.

Now affiliated with Creative Labs, Cambridge SoundWorks (800-367-4434, www.hifi.com) continues to roll out high-quality sound systems. The latest

from the pipeline is **PC Works** (\$100 street). The unit sports dual 3-inch main speakers and a separate subwoofer that includes a three-channel power amplifier. The speakers are suitable for use on the road and are powered by a rechargeable battery or car lighter. They also feature an inline remote volume control and desktop stands.



HEAR HERE: Speakers from (left to right) Altec Lansing, GNT, and Cambridge SoundWorks.

Yamaha Corp. (800-823-6414, www.yamaha.com) has its own low-priced upgrade, the **System 25** (\$130 street). Belying its small

size, the System 25 belts out 25 watts of total power: 5 watts each from two small satellite speakers, and 15 watts from the standalone subwoofer. The subwoofer also



has two audio inputs to connect it with a CD player or other audio device and a headphone jack with automatic muting.

Another high-powered, low-priced entry is the 32-watt, \$54.95 **GNT-5000** from GNT Electronics (408-727-3856, www.gntelec.com).

You can adjust volume, treble, and bass on the 5.5-inch subwoofer, and the two satellite speakers each put out 13 watts of power.—*Michael Rusignuolo*

COLOR LASER PRINTERS

Over the Rainbow

Lately, the color laser market has been heating up. We review five of the new color lasers in this issue's "Laser Printers: Clear, Crisp, and Color!", but a few worthy products were unable to meet our testing deadline.

The Panasonic Computer Peripheral Company (800-742-8086, www.panasonic.com/alive) recently released its **KX-PS8000** and **KX-P8410** series of color laser printers and imaging systems. Both lines offer up to 1,200- by 1,200-dpi printing, and both are targeted at corporations with in-house desktop publishing needs. All the Panasonic units are networkable, can print on a wide variety of media, and come standard with the company's one-year swap warranty, which provides a replacement unit in the event of a breakdown.

Printers from the high-end KX-PS8000 series ship with a

minimum of 16MB of RAM (expandable to 80MB) and are powered by a 16-MHz RISC microprocessor from AMD. Panasonic rates the print engine at 14 pages per minute (ppm) for monochrome output and 3.5 ppm for color. Another bonus: Each machine includes an integrated 9,600-dpi color flatbed scanner that connects to the PC via a SCSI interface. This lets

you use the printer as a walk-up color copier, and at \$10,000 it costs far less than a standalone color laser copier.

The KX-P8410 series (\$3,000 street) comes with a minimum of 8MB (expandable to 72MB) of RAM and uses the same 16-MHz AMD processor as the PS8000 series; it does not include the built-in scanner, however.

QMS (800-523-2696; www.qms.com) has recently unveiled a new family of color laser printers. The QMS magicolor 2 series is targeted at enterprise networks and graphics professionals who need speed

as well as quality. The \$3,499 **QMS magicolor 2 CX** can print out at 600-dpi resolution and support a variety of networking platforms. It comes standard with 24MB of RAM and is expandable to 384MB. Up a notch is the \$4,999 **QMS magicolor 2 EX**, which throws in an internal hard disk, PostScript support, 80MB of RAM, and a number of print-emulation options. Both printers are powered with the 64-bit, 133-MHz NEC VR4300 RISC microprocessor, and both ship with a one-year parts-and-labor warranty that includes on-site service.—*Josh Levy*

MULTIMEDIA PRESENTATIONS

Sound for a Crowd

If multimedia presentations on the road are your bag, consider the new Presentation Audio System, made by Mediaphile AV Technologies (612-559-1019, www.mediaphile.com). The complete system (\$250 street) fits two dome-shaped satellite speakers, a subwoofer, a tabletop volume control, and a power pack into a 7-pound package. Using Mediaphile's Group Listening Technology, sound is distributed evenly in all directions, so that all participants at a conference table hear the same volume and timbre. If you want to carry less, tuck the 2-pound satellites (\$100 street) into your bag. Their sound reproduction is more than adequate for business audio.—*Jamie Bsaies*



Trends Applications Development

DATA NAVIGATION TOOLS

Conceptual Mapping

If you've ever had a hand in transitioning a company's information storehouse to an intranet, you know how difficult the process can be. Not only do you have to reconcile legacy databases with other, diverse sources, but you also have to create an accessible, intuitive information structure.

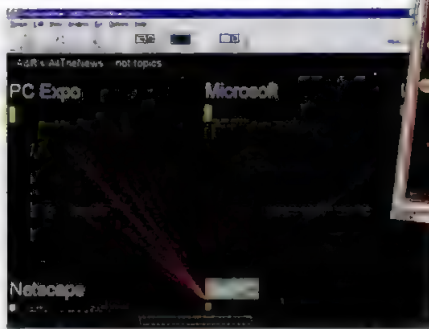
One solution is conceptual mapping—visual, navigable representations of the relationships between pieces of data. Three companies have developed new classes of servers and browsers that help you reach this goal of interactive information retrieval.

Perspecta's Java-based **Perspecta SmartContent System** provides the components needed to create, serve, and navigate information spaces (415-437-4150, www.perspecta.com). You make use of a collection of tools to establish your information's Smart-

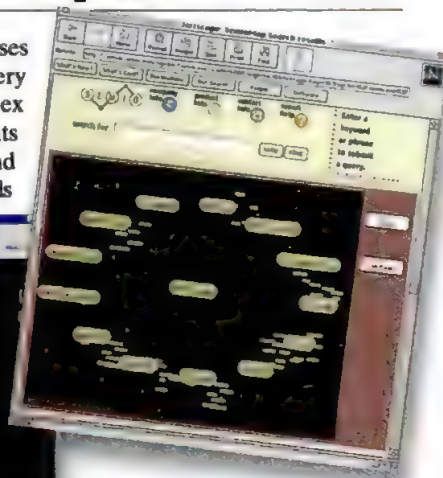
Content, or metadata—that is, information about your information, such as concepts, authors, and sources. With the Perspecta SmartContent Server, you can organize SmartContent, determine relationships, and manage multiple sessions. The free PerspectaView browser lets end users navigate a 2.5-D view of concept terms linked by lines to related information. The company plans to offer the viewer as a Java applet later this year. Pricing for Perspecta's system, which can be implemented on intranets, extranets, and the Internet, begins at \$30,000.

SemioMap Global Intranet Solution, from Semio Corp. (415-802-

2940, www.semio.com), uses the company's own discovery search technology to index HTML and text documents based on lexicographic and semiotic analysis (see Trends



DATA LINK: Diagram your databases with Perspecta (above) and SemioMap (above right).



and extranets, SemioMap Intranet Solution begins at \$30,000.

If you've integrated your data sources and just need a navigation tool, try MerzCom's (514-973-5852, www.merzcom.com) **MerzScope** (\$395 per server). Developers can use this Java application to build graphical maps of a single site or several sites. You can customize the map nodes with graphical images, and users can adjust granularity with a slider bar. —Michael W. Muchmore

VISUAL JAVA PROGRAMMING

Java Made Easy

We've come a long way since the days of the first Java development tools, when programming was command line only and you worked without debuggers or

that of any language tool on the market. Three new products—each supporting JDK 1.1—further simplify your life with visual programming for Java.

Sun Microsystems' \$79 **Java Studio 1.0** (800-786-7638, www.sun.com) lets you quickly assemble applications out of JavaBeans (code components written in Java). You program by drawing connections from one Bean to another and channeling data between them. Sun also recently released the \$99 **Java WorkShop 2.0**, a tradi-

tional programming tool for creating JavaBeans.

Beginners and experts alike

can use Borland International's \$99.95 **JBuilder Standard** (408-431-1000, www.borland.com) to create and use JavaBeans. Borland's two-way tools let you work with your program graphically or in code; changes to one are updated to the other. A \$299.95 Professional version includes extensive database access and additional development tools.

Parts for Java 2.0, from ObjectShare (408-720-7585, www.objectshare.com), provides a rich environment for visually designing classes, applications, and JavaBeans. This \$149.95 package comes with wizards for creating distributed applications using either Java's native RMI or the industry-standard CORBA specification. —Larry Seltzer

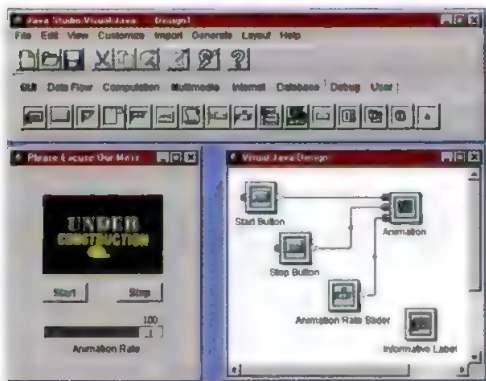
CROSS-PLATFORM PROGRAMMING

ASP for Everyone

Until recently, using Microsoft Active Server Pages (ASP) meant your site had to be running a Microsoft Web server. Now, however, you can use ASP and still be server-agnostic, thanks to **Chili!ASP**, a series of solutions from Chili!Soft (717-290-8346, www.chilisoft.net).

The Chili!ASP engines allow a variety of servers—including Lotus Domino GO, Netscape Enterprise and FastTrack, and O'Reilly's WebSite Professional—to handle ASP. Chili!ASP integrates cleanly with each server's API, letting you drag and drop ASP applications between servers and run them with no code changes.

You can download Chili!ASP from the company's Web site. A version supporting unlimited concurrent users costs \$995; a ten-user version is \$695. Chili!Soft is working on an engine for Sun's Solaris, with a release planned for the fourth quarter of this year. —Regina Kwon



FIVE EASY PIECES: Drag-and-drop application assembly with Sun's Java Studio.

class browsers. The latest Java tools herald a development environment as rich and mature as



Now add digital images to your work fast, and easy.....



Introducing Digital Mavica®.

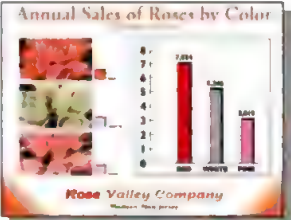
The World's First 3.5" Floppy Disk Digital Camera



Presentations



**Documents/
Publications**



**Databases/
Spreadsheets**

From internal newsletters to company reports, wherever there's a story to tell, you can tell it better with pictures taken with a Sony Digital Mavica.

Digital Mavica is compatible² with Windows® 3.1/Windows® 95/
Windows NT® 4.0 or Mac™ OS System 7.5.

SONY

like never before!

With Sony's new Digital Mavica® Still Camera, adding pic-



SHOOT!

Point and shoot!

tures and images to make professional looking documents has never been easier.

Digital Mavica records on a standard computer floppy so you can play it back on virtually any PC.

No more hassles with cables, interfaces or drivers.



Finally, a Digital Still Camera with Real Camera Features

like a 10x power zoom lens with 1" macro capabilities and auto-focus, auto-white balance and



10-to-1 ZOOM LENS

auto-iris for proper exposure

and a built-in flash and self-timer. Five Camera Mode Settings allow con-

trol of prevailing light conditions:

- Portrait • Landscape
- Beach and Ski • Sports
- Sunset and Moon

Never miss a shot!

Sony's InfoLithium™

Rechargeable Battery allows up to 500 continuous shots¹ with a single charge as it powers a large 2.5" color LCD screen for composing, monitoring and playback.

Digital Mavica is compatible with virtually any PC. It

uses universally compatible high density 3.5" standard computer floppies that can hold up to 20 high

resolution or up to 40 standard resolution images in 24 bit color, 640 x 480 (VGA) JPEG format.

Slip the floppy into a PC and watch the work come alive. Digital Mavica is compatible² with

STORE!

A single disk can store up to 40 images!

Windows®3.1/Windows®

95 /Windows NT®4.0 or

Mac™ OS System 7.5. Add

images to your spreadsheets, newsletters, Websites or any

popular imaging software. Digital Mavica also comes with ArcSoft

PhotoStudio for creative options to manipulate images, add text and change backgrounds.

If you can picture it on a floppy, you can see it in your work!



SHOW!

Watch your work come alive!

Digital Mavica®

Imagine That. On a Floppy.™

www.sony.com/mavica

Trends Networking

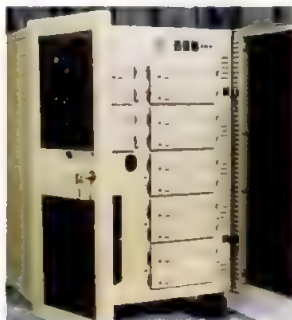
NETWORK CD-ROMS

Sharing the Silver Platter

Sharing CD-ROMs on a network has always been a relatively complicated proposition. Windows NT, Novell IntranetWare, and other network operating systems give you only rudimentary CD-sharing capabilities at best. Microtest and Meridan Data both offer CD-sharing hardware and software products that fill in the gaps left by the NOSs. The newest players to enter the market are Hewlett-Packard (800-533-1333, www.hp.com) and Realm Information Technologies (770-446-1332, www.realminfo.com).

Starting this fall, Hewlett-Packard will be offering a suite of CD-sharing products, including the HP CD-ROM Server,

HP 12/20X CD-ROM drives, and the CD-ROM Tower. The \$695 **HP CD-ROM Server** is available in two versions. The external version connects directly to the LAN and lets you share third-party CD-ROM drives, while the internal version fits in one of the slots in the HP CD-ROM drive tower. Both versions let users access up to seven disks under a single drive letter via Windows



SMALL UNIVERSE: The S-1 Server supports many media types.

Explorer. Each also has its own Web server that lets users access CDs with a Web browser. HP dubs the CD-ROM Server a "thin server" since it sits on the

network totally independent of a file server.

For a turnkey solution, HP offers its tower enclosure, which includes the HP CD-ROM Server and seven SCSI-based HP 12/20X CD-ROM drives, for \$4,140.

Like the HP solution, the **Realm Universal S-1 Server** can be placed anywhere on the network. Nevertheless, the Realm comes in just two tower configurations: a minitower with 4 bays and a full-size

tower with 14 bays. The software, which is preinstalled on the tower, works with several client OSs, including Windows 3.x and 95, Unix, Macintosh, and OS/2 Warp Connect. Unlike the Hewlett-Packard, which only works with CD-ROM drives and changers, the Realm product works with minichangers, DVD drives, rewritable optical drives, and even SCSI hard disk arrays. As with the Hewlett-Packard package, several CD-ROMs can be mapped as directories under a single drive letter and users can access disks via a Web browser. Administration is also accomplished through a Web browser.

The Universal S-1 Server can handle up to 255 drives in expansion chassis connected by SCSI cabling to the main tower. Prices start at \$5,995 for a minitower with four 20X SCSI CD-ROM drives.—*Leon Erlanger*

REMOTE ACCESS

Bye-Bye Modem Rack

Running and supporting corporate-level remote access has never been for the faint of heart. The remote-access servers require investments of tens to hundreds of thousands of dollars, depending on the scale. And once that initial investment has been made, you have the ongoing cost of supporting all of the phone lines, not to mention keeping up the latest in modem technology.

New Oak Communications (508-266-1011, www.newoak.com) is rethinking how it should handle corporate remote access. New Oak's new \$50,000 **NOC**



NEW IDEA: The NOC 4000 uses the Net to connect remote users.

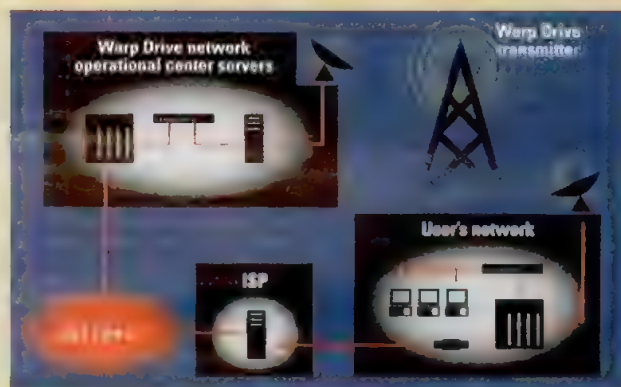
4000 Extranet Access Switch leverages the Internet and eliminates the need for costly modem racks and 800 numbers.

Remote users can now connect to the NOC 4000 and their corporate networks using a local Inter-

net service provider and point-of-presence. Security is provided by a choice of several tunneling protocols (PPTP, L2F, L2TP, and IPsec) and encryption schemes (DES, Triple DES, RC-4, and RSA). Each unit is capable of handling up to a thousand remote users and can provide a total throughput of 45 Mbps.

The chassis of the NOC 4000 features a 200-MHz Pentium Pro processor, dual 10/100 Ethernet ports, and dual redundant power supplies. New Oak also offers an optional T1/E1 card and optional redundant storage systems. The unit is fully configurable from any workstation using HTML and Java. It also includes a QuickStart feature that allows it to run in default mode in only a few minutes.—*Robert Daly*

INTERNET CONNECTIONS



The Wireless Internet

In the past, businesses had few options for connecting to the Internet. Small businesses gravitated to the unlimited-usage, \$20-a-month dial-in connection provided by their local Internet service providers, while larger businesses invested in a T1 or T3 connection. Helping change the landscape is Warp Drive Networks (408-938-9030, www.warp-drive.net) **Warp Access Service**.

The service uses the 2.1-GHz range of the MDS spectrum and the 510- to 600-MHz range of the UHF spectrum to deliver a wireless Internet connection. Currently available in the Silicon Valley and Seattle markets only, the Warp Access Service provides a 128-Kbps connection for a start-up fee of \$50 per single user and a monthly charge of \$150. The only equipment needed is the Warp Router, which comes in single (\$395) and multiuser (\$1,195) configurations.

Although the base service offers the same throughput as a BRI ISDN connection (128-Kbps), users can grow their connections as their bandwidth demand increases, to a maximum throughput of 10 Mbps.—*RD*

STATISTICA

NEW: '97 Edition

STATISTICA (automatically configures itself for Windows 95/NT [long file names, etc.] or 3.1) ■ A complete data analysis system with thousands of on-screen customizable, presentation-quality graphs fully integrated with all procedures ■ Comprehensive Windows support, OLE (client and server), DDE, customizable *AutoTask* toolbars, pop-up menus ■ Multiple data-, results-, and graph-windows with *data-graph* links ■ The largest selection of statistics and graphs in a single system; comprehensive implementations of: Exploratory techniques with advanced brushing; multi-way tables with banners (presentation-quality reports); nonparametrics; distribution fitting; multiple regression; general nonlinear estimation; stepwise logit/probit; general ANCOVA/MANOVA; variance components; stepwise discriminant analysis; log-linear analysis; confirmatory/exploratory factor analysis; cluster analysis, multidimensional scaling; canonical correlation; item analysis/reliability; correspondence analysis; survival analysis; a large selection of time series modeling/forecasting techniques; structural equation modeling with *Monte Carlo* simulations; and much more ■ On-line *Electronic Manual* with comprehensive introductions to each procedure and examples ■ Hypertext-based *Stats Advisor* expert system ■ Workbooks with multiple *AutoOpen* documents (e.g., graphs, reports) ■ Extensive data management facilities (fast spreadsheet of unlimited capacity with long formulas, *Drag-and-Drop*, *AutoFill*, *Auto-Recalculate*, split-screen/variable-speed scrolling, advanced Clipboard support, DDE links, hot links to graphs, relational merge, data verification/cleaning) ■ Powerful *STATISTICA BASIC* language (professional development environment) with matrix operations, full graphics support, and interface to external programs (*DLLs*) ■ Batch command language and editable macros, flexible "turn-key" and automation options, custom-designed procedures can be added to floating *Auto Task* toolbars ■ All output displayed in *Scrollsheets*™ (dynamic, customizable, presentation-quality tables with instant 2D, 3D, and multiple graphs) or word processor-style report editor (of unlimited capacity) that combines text and graphs ■ Extremely large analysis designs (e.g., correlation matrices up to 32,000x32,000, virtually unlimited ANOVA designs) ■ Megafile Manager with up to 32,000 variables (8 Mb) per record ■ Unlimited size of files; extended ("quadruple") precision; unmatched speed ■ Exchanges data and graphs with other applications via DDE, OLE, or an extensive selection of file import/export facilities (incl. *ODBC* access to virtually all data bases and mainframe files) ■ Hundreds of types of graphs, incl. categorized multiple 2D and 3D graphs, ternary 2D/3D graphs, matrix plots, icons, and unique multivariate (e.g., 4D) graphs ■ Facilities to custom-design new graph types and add them permanently to menus or toolbars ■ On-screen graph customization with advanced drawing tools (e.g., scrolling and editing of complex objects in 32x real zoom mode), compound (nested) OLE documents, *Multiple-Graph AutoLayout Wizard*, templates, special effects, icons, page layout control for slides and printouts; unmatched speed of graph redraw ■ Interactive rotation, perspective and cross-sections of 3D displays ■ Large selection of tools for graphical exploration of data: extensive brushing tools with animation, fitting, smoothing, overlaying, spectral planes, projections, layered compressions, marked subsets ■ Price \$995.

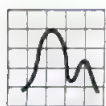
Quick STATISTICA (for Windows) ■ A subset of *STATISTICA*; comprehensive selection of basic statistics and the full analytic and presentation-quality graphics capabilities of *STATISTICA* ■ Price \$495.

STATISTICA Industrial System (requires *STATISTICA* or *Quick STATISTICA*) ■ The largest selection of industrial statistics in a single package: quality control charts (real-time data acquisition options), process capability analysis, R&R, sampling plans, and an extremely comprehensive selection of experimental design (DOE) methods ■ Flexible tools to customize and automate all analyses and reports (incl. "turn-key" system options, and tools to add custom procedures) ■ Price \$995.

STATISTICA/Mac (for Macintosh) ■ Price \$695 (Quick - \$395)

Overseas prices vary. Domestic sh/h \$12; 30-day money back guarantee

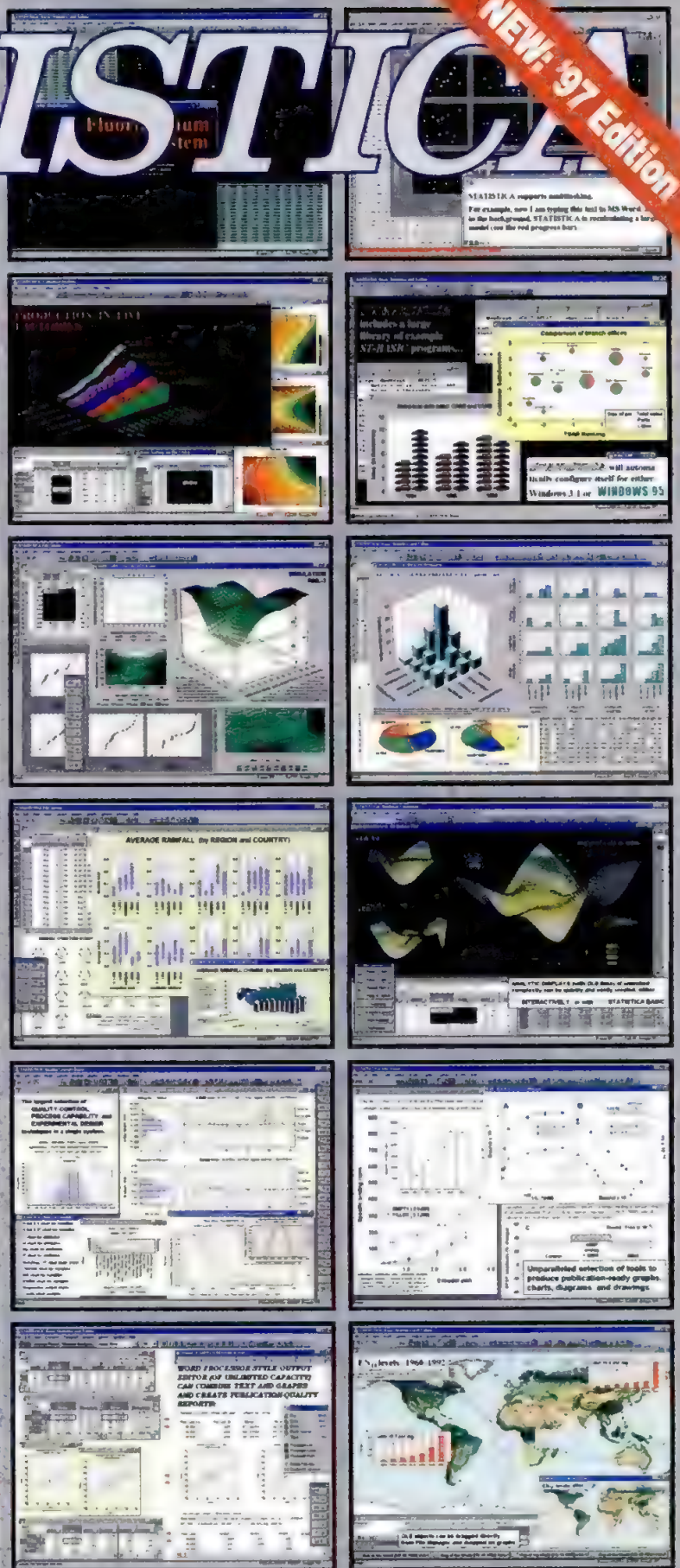
STATISTICA has received the highest rating in EVERY comparative review of statistics software in which it was featured, since its first release.



StatSoft

2300 E. 14th St. • Tulsa, OK 74104 • (918) 749-1119
Fax: (918) 749-2217 • WEB: <http://www.statsoft.com>
e-mail: info@statsoft.com

- StatSoft Ltd. (London, UK), ph: +44 1234 341226, fax: +44 1234 341622
- StatSoft GmbH (Hamburg, Germany), ph: +49 40/468866-0, fax: +49 40/468866-77
- StatSoft France (Paris, France), ph: +33 01-45-185-999, fax: +33 01-45-185-285
- StatSoft Polska Sp. z o.o. (Krakow, Poland), ph: +48 12-391120, fax: +48 12-391121
- StatSoft Italia (Padova, Italy), ph: +39 49-893-4654, fax: +39 49-893-2997
- StatSoft Pacific Pty Ltd. (Australia), ph: +613 9521 4833, fax: +613 9521 4208
- StatSoft Japan (Tokyo, Japan), ph: +813 3667 1110, fax: +813 3668 3100
- StatSoft Taiwan (Taipei, Taiwan, R.O.C.), ph: +886 2 5786587, fax: +886 2 5793179



The complete line of StatSoft products and training consulting services are available from authorized representatives worldwide, including Austria, Belgium, Brazil, Chile, Czech Republic, Denmark, Finland, Greece, Hungary, India, Korea, Malaysia, Mexico, The Netherlands, New Zealand, Norway, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Turkey. Please contact your nearest StatSoft office for the authorized representative nearest you. StatSoft, the StatSoft logo, STATISTICA and Scrollsheet are trademarks of StatSoft, Inc.

CIRCLE 057 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

**Your
old
monitor.**

**Your
new
monitor.**



Thin by comparison. Revolutionary by design. Introducing Philips **Brilliance® 4500AX Flat Panel LCD Monitor**. As you can plainly see, it requires significantly less desk space. That's because it's only 5.9 inches deep and has built-in stereo speakers (and weighs 11.4 pounds). Together with stunning graphics, sharper text and flicker-free images, our new monitor delivers in every dimension. For more information, (800) 835-3506 or www.philipsmonitors.com

© 1997 Philips Electronics North America Corporation
CIRCLE 015 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



PHILIPS

Let's make things better

First Looks



Travel Aid From Your PC

Four trip-planning software packages add data links for location and attraction information—and they're all \$50 or less.—By Bruce Brown

Ready to hit the open road? Gain the advantage of planning ahead by using one of these four trip-planning software packages. The latest versions of these programs all add new features over their predecessors, improving usability and keeping prices low.

The four programs tested for this roundup are Delorme's AAA Map'n'Go 3.0 (\$40 street price), Microsoft's Expedia Trip Planner 98 (\$40 street), Rand McNally's TripMaker Deluxe 98 (\$44.95 direct), and TravRoute Software's Door-to-Door 98 (\$50 street). In addition to having more street and route data, all feature more flexible interfaces, a greater selection of on-disk travel information, and richer complementary Web sites with more varied Web links.

Plus, each has added partners for locating and rating accommodations and restaurants. All but one of the packages work with GPSs for in-car trip tracking. Whether used for family vacations or for business travel, the latest crop of software packages is ready to assist before and during trips.

FIRST THINGS FIRST

The primary purpose of these four programs is simple: to create detailed routes for trips. Each company also sells other routing, mapping, or street-finding software with different features and data.

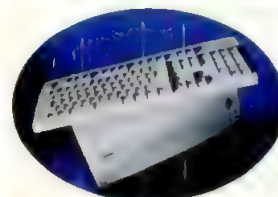
In each case, you enter starting and ending locations of your trip and add intermediate stops. Once all the stops for a trip are entered, you calculate or "run"

the trip, which results in a set of driving directions and maps. This can then be printed or viewed on your PC.

From the PC, you can zoom in on maps to show more detail or display them on a larger scale as an overview of your trip. If you print the maps, you can select from trip summaries, route directions, overview maps, location detail maps, or complete travel packages.

To individualize trip planning, each program lets you set your preferences or profile, with settings ranging from desired maximum speeds to different types of roads. TripMaker Deluxe also lets you filter exit information to display only those exits that have nearby ATMs plus national-brand service stations and restaurants.

INSIDE



THIN CLIENT:

Compaq enters the Net PC market with its compact, manageable Deskpro 4000N. See page 56 for the full review.

MINI-MIGHTY:

Digital, Panasonic, and Sony pack a lot of power into their new lightweight notebooks. See page 60.



LIGHT AND POWERFUL:

Epson's PowerLite 7000 LCD projector will enhance your portable presentations. For the review, see page 68.



NET CALLS:

VocalTec's latest release of Internet Phone makes telephony user-friendly. See page 73 for the review.



More Products Reviewed...

Nimantics Persona T-120	61
IBM Via Voice	64
ViviCam 3000	76
UMAX MDX-8000	76

First Looks

You can also choose whether the program should calculate your trip with the quickest or shortest possible route, or you can simply use personal preferences for road types.

AAA Map'n'Go, Trip Planner, and TripMaker Deluxe are more oriented toward tourism and vacation travel than Door-to-Door. Each includes extensive destination and tourist attraction information as well as popular scenic drives that take in local sights and attractions. All four companies have Web sites

States. The other three programs do have street-level data for major metropolitan areas, with some support for address searching. But Door-to-Door is the only one that lets you specify any of 95 million U.S. business and residence addresses for lookups; it's also the only program to include in-route calculation. The other three companies sell companion street atlas programs, but TravRoute's software in-

achusetts, and West Hartford, Connecticut. Among the addresses specified were an old fire road in Maine and relatively new roads or addresses in five different towns.

The bottom line determined

trips. Besides requiring that you run a PC and a GPS unit in the car while traveling (a potentially dangerous distraction if they are both being operated by the driver), much of the benefit of a GPS is lost if you can't also dial

in to the Internet with a modem using a cellular or some other type of wireless service. A GPS and PC can be an invaluable pair, however: If you get lost, a GPS unit could most likely determine your location coordinates (as long as you can see the sky).

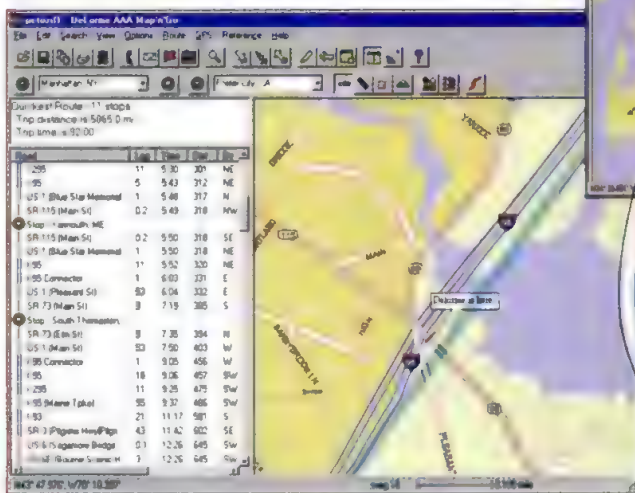
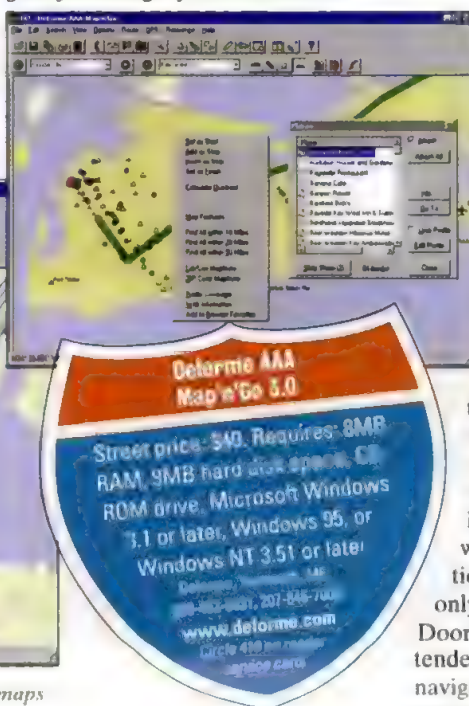
Three of the tested programs interface with GPS receivers (not included), for tracking current position or while following a calculated route. The only program that lacks this feature is TravRoute's Door-to-Door, which the vendor positions for pretrip planning only. TravRoute's Door-to-Door CoPilot (\$499 list), intended specifically for in-car navigation, uses the same data set and includes a GPS receiver along with interactive voice technology.

RATING THE FOUR

All four of these products are capable of meeting your trip-planning needs. Each provides detailed itinerary maps and directions as well as information on destinations, attractions, and accommodations.

Our Editors' Choice—Rand McNally's TripMaker Deluxe 98—stands out from the pack as the best. It provides a great deal of in-depth travel information, great Web content, and activity packs for kids. If you need highly detailed street directions, TravRoute's Door-to-Door is the product for you. In any case, having no sense of direction is no longer a good excuse for staying home on the couch.

LOCALIZED: Right-clicking on a specific location gives you listings of local attractions.



ZOOMIN': Delorme AAA Map'n'Go 3.0 lets you add objects to maps and displays trip directions and zoomed maps simultaneously.

with varying amounts of travel-related information and services, as well as links to other sites for destinations, attractions, accommodations, lodging, transportation, and reservations.

Three of the four packages have forged strong partnerships with very recognizable consumer travel information sources. Partners include AAA Map'n'Go's AAA travel directory, Microsoft Expedia Trip Planner's Zagat Survey restaurant guide, Woodall's RV and campground directory, and TripMaker Deluxe's Mobile Travel Guide.

As its title implies, Door-to-Door is the only one of the four programs that can calculate turn-by-turn, door-to-door directions for the entire United

cludes trip planning and a street atlas on one CD-ROM.

HOW WE TESTED

To test the trip-planning packages, we installed each one on a Gateway Solo 9100 notebook PC with a 166-MHz Pentium MMX CPU and 32MB of RAM. A location trip was entered using each program's trip wizard or table-format entry interface, starting at PC Magazine in New York and ending at Ziff-Davis Labs in Foster City, CA.

Stops along the way included each of the four vendors' addresses or towns: Gateway 2000's home town of North Sioux City, South Dakota; small towns we selected in Maine, Pennsylvania, and California; and Edgartown, Mass-

by our testing is that each program successfully calculated a route that included all 12 locations. The time to calculate the trips took anywhere from 12 seconds for the Rand McNally program to 1 minute and 48 seconds for TravRoute's program, which was working with more granular data at most of the stops (it calculated based on individual addresses). Each of the other two programs completed the task in 34 seconds. The quickest trip-routing option was specified in each case, resulting in only some minor differences among routes.

THE GPS CONNECTION

Not everyone agrees on the use of GPS (Global Positioning Satellite) receivers during road

Delorme

Delorme AAA Map'n'Go 3.0

Delorme's AAA Map'n'Go 3.0 combines trip planning with extensive travel information. What keeps this upgrade of last year's Editors' Choice-winning package (November 5, 1996) fresh is the addition of a database of services found near highway exits. The database includes service stations, food outlets, lodging, rest areas, and police and medical services.

Coupled with the 1997 AAA Tourbook database of accommodations, restaurants, attractions, and campgrounds, AAA Map'n'Go is a formidable trip-planning solution, even though it lacks the sophisticated wizards used in the products from Microsoft and Rand McNally. The software is as straightforward and easy to use as ever, thanks to its flexible user interface.

AAA Map'n'Go includes other new features: 80 scenic drives; weather almanac and radio station information; map customizing and measuring with lines, circles, and polygons; routable roads within major cities; and Web references to 250 major cities plus links to even more Web sites for other cities. Simply right-clicking on a map pops up a menu window from which you can select starting, ending, or intermediate points on your trip; find attractions within a 10-, 20-, or 50-mile radius; or locate Web site references for the closest city or region.

Before planning trips, you can define a user profile that goes far beyond route preference. You can choose among the quickest, shortest, preferred, or scenic routes. Maps can be magnified to display attractions. Other preferences that can be factored in include budget limits and AAA Diamond ratings for accommodations and restaurants; you can even filter lodging choices to find those that allow pets.

Editors' Choice

• Rand McNally TripMaker Deluxe 98



Each of the four programs in this roundup does a great job of trip routing, providing helpful on-screen maps and directions. Each can also print overview or detailed maps

with directions on the same or separate pages.

Rand McNally's TripMaker Deluxe 98, however, stands out as the best overall trip planner, and it earns our Editors' Choice award. TripMaker Deluxe 98's trip-planning wizard, map details (including accurate street information for many urban areas), in-depth travel and attraction information (including the Mobile Travel Guide), features for traveling with children (including activity packs), highway-exit service filtering, superior and flexible GPS interface, and developed Web content are all impressive. The program was also the fastest at calculating our test trip. The Rand McNally online reservation system wasn't functional at the time of our testing, but otherwise this program was outstanding.

As with the previous version, you can search Delorme's program by place name, address, zip code, and phone number. The program doesn't have street maps for all areas, but you can download maps from the vendor's Street Atlas 4.0 for more detail in specific areas.

While planning a trip, you can select the Along the Way option to compile a listing of attractions and points of interest within 10, 20, or 50 miles of your route. AAA Map'n'Go automatically compiles a list from which you can select individual items in order to obtain more information; the program can also present a slide show with descriptions and, where applicable, photos and audio tracks. No video clips are included.

Through the user profile, you can customize the sites you've selected. For example, you can design tours of agricultural sites, cultural and ethnic sites, or sports and recreation facilities and attractions. This ability to

create a list and a presentation of places to see and things to do is a powerful feature.

There are several ways to select starting, ending, and intermediate trip stops, including using menu items and toolbar buttons or simply pointing to a location on a map. There is no trip-planning wizard, but selecting trip components is quick and simple with pop-up selection windows that refine a list of site or location possibilities while you type.

When viewing maps in AAA Map'n'Go, you can select either a default interface, with a map covering most of the screen and a toolbar, or a classic interface, with separate tool box and overview map windows. You can also click on online indicators, which show areas on the map for which there are Web sites with lists of events, information about road construction delays, and weather reports. This information can be updated quickly via an Internet browser

The other programs here have great features worth mentioning. Microsoft Expedia Trip Planner 98 has an excellent online reservation system and other Web resources and a powerful pushpin feature. Trip Planner 98's trip-planning wizard and level of travel and attraction information rival TripMaker Deluxe 98. Delorme AAA Map'n'Go 3.0's strong points include its detailed personal profile and its ability to create lists and slide shows of locations and attractions based on your preferences. Map'n'Go 3.0's facile interface plus the program's affiliation with AAA travel information are additional highlights. TravRoute Software's Door-to-Door 98 combination trip planner and street atlas remains the program of choice if your travel needs call for turn-by-turn, address-level maps and directions.

prior to or during trips.

Moving around the maps is easy—you can click on a map point to center it or move the map with an eight-position compass rose. You can also zoom in and out with single clicks of the mouse or move out four levels using only one click. After you create a trip, you can view it on-screen or print a variety of hard-copy trip aids, including directions, maps, detailed location maps, and AAA-style strip maps of the whole route.

Two promised features not available in time for this release were the Delorme Trip Agent, a voice-interactive animated character that uses a beta version of Microsoft's Agent, and the ability to make reservations and view vacation packages via the Internet.

AAA Map'n'Go supports NMEA-compliant GPS receivers, including Delorme's own TripMate Hyperformance GPS (\$150, including Street Atlas USA). With a GPS, a

First Looks

green arrow shows your position and direction and marks your progress with a trail. A pop-up box indicates latitude, longitude, altitude, bearing, atomic time, and current speed.

On the whole, AAA Map'n'Go is a value-loaded program. Although it does not contain the trip-planning wizards found in TripMaker Deluxe and Expedia Trip Planner, Map'n'Go combines flexible and easy route planning with quick lookup of facilities, conveniences, and attractions. It also offers a strong collection of well-organized Web information.

Microsoft Corp.

Microsoft Expedia Trip Planner 98

Microsoft's Expedia Trip Planner 98 capitalizes on the vendor's Expedia Web site, which can be used to access destination weather, events, and road-condition information and to make online hotel, airline, and car-rental reservations. Trip Planner 98 is intended for vacationers, with an emphasis on national parks and other attractions. But it can be helpful for business travelers as well, especially those who want to see the sights along the way.

New features in the 1998 version of this product (previously called Microsoft Automap Trip Planner) include restaurant ratings and descriptions from the Zagat Survey as well as information from Woodall's directory of campground and RV sites, parks, and service centers. A single disk contains in-depth information about national parks (including terrain maps) and scenic drives; articles about and links for regions, states, and cities; and the Expedia hotel guide of more than 19,000 accommodation listings.

Expedia Trip Planner 98 Travel Guide has extensive multimedia content, including conventional and panoramic photographs. It also features audio

tracks, including regional- and ethnic-music clips. An attractive light-board-like display is used to identify which items include music or panoramic shots; you can also use it to select photographs. No video clips are included, however. Families planning trips with children will appreciate the Kid Picks feature, which selects points of interest for children.

Trip profiles let you plan out exactly when you want to start and stop driving each day. They also let you choose

preferences and enter construction or congestion areas you wish to avoid. For quicker, easier routing, you can zoom to the points on your trip and place

ing-scale map zooming, multiple ways to move maps, and browser-like Back and Forward buttons on the toolbar all aid screen navigation. You can click on a map location to find nearby points of interest, and you can mark a spot with a pushpin. Pushpins, which are saved in named sets, each consist of a symbol and name, plus optional content (notes, photos, drawing, or Web links) of up to 1MB of information. Pushpin sets can be shared with other Expedia Trip Planner 98 and Streets 98 owners, and they can be used to create sets of map-related details about customers or business events or personal diaries that record events during a trip. They can also be used as locations for trip-routing calculations.

Printed trip information can include overview maps, summary statistics, itinerary, and a digest of selected attractions. You can print each segment or day starting with a new page, or you can print using the least amount of pages.

Trip Planner 98 supports GPS receivers; nevertheless, if you use a serial-port receiver you'll have to configure it manually by using an included setup program. PC Card-style GPS units configure automatically. When you

travel with the GPS in operation, a variable-size icon marks your position and also tracks your progress. A table displays heading, position, time, and current speed; during testing, however, the speed indicator was not as consistent as the same feature used with the same GPS on the same route with AAA Map'n'Go and TripMaker Deluxe.

The Internet content of Microsoft's Expedia Web site—



FUEL UP: Microsoft's Expedia Trip Planner 98 will remind you when to stop for gas.

whether you want to drive straight through or cut short a day's travel within a specified time range. Although it seems risky relying on a PC to track your car's gasoline mileage, you can still enter the size of your gas tank and your car's average highway and city mileage. The program will then insert refueling reminders in your itinerary. You can also set road-type preferences and maximum speeds.

When you plan a specific trip, you make use of a series of wizard screens that allow you to adjust your user profile. You can then select from quickest, shortest, and preferred routing, which can include an emphasis on scenic roads. For each segment of your trip, you can choose your



WEB LINKS: Expedia Trip Planner 98's Travel Guide lets you access regional information on national parks and scenic drives.

flags for the origin, final destination, and intermediate stops.

Trip Planner 98 isn't a street atlas program (the separate Expedia Streets 98 and Streets 98 Deluxe interactive mapping programs fill that niche), but many streets are displayed in major urban areas. You cannot search by address or street levels.

Moving around and viewing maps in Trip Planner 98 is quick and flexible. Single-step or slid-



Juiced Up.

Call now to order.
800-707-2329
www.micronpc.com



CONFIGURED FOR YOUR LIFE

Pick Micron.

We've got the best computers in the bunch.

At Micron, we know you want the freshest technology out there. So our engineers are continually devising new ways to make our award-winning PCs smarter, faster and more fun. Whether you use your computer for home or business, we've got a system for you. And you'll never find a lemon in the bunch. Our components go through rigorous quality-assurance testing, and all Micron™ products conform to the highest industry certification standards.

When you pick Micron, you can custom configure a system that fits your specifications - so it's homegrown, not mass-produced. Pick Micron and you'll get the steadfast 24-hour customer support that we're famous for. And when you pick Micron, you're getting one of the best limited warranties in the business from one of the best companies in the industry.

So pick Micron today. It'll be good for you.

Lots of zing.

Portables



The Micron TransPort™ Series. Notebooks with real bite.

What's small, sweet and gives you a lot of punch?

A Micron TransPort notebook, of course. Our outstanding line of portable PCs offers impressive flexibility, tempting prices and the hottest features on the market.

High-end users will love our TransPort XKE. A true desktop replacement, we've loaded our XKE with a high-performance graphics accelerator, active matrix screen, upgraded CD-ROM, tons of memory and more. Our TransPort XPE fits the bill if you're looking for a top-grade computer for home, office or travel. And our TransPort VLX offers flexibility and sleek styling for a more-than-palatable price.

So pack a little punch. Try our TransPort notebooks.

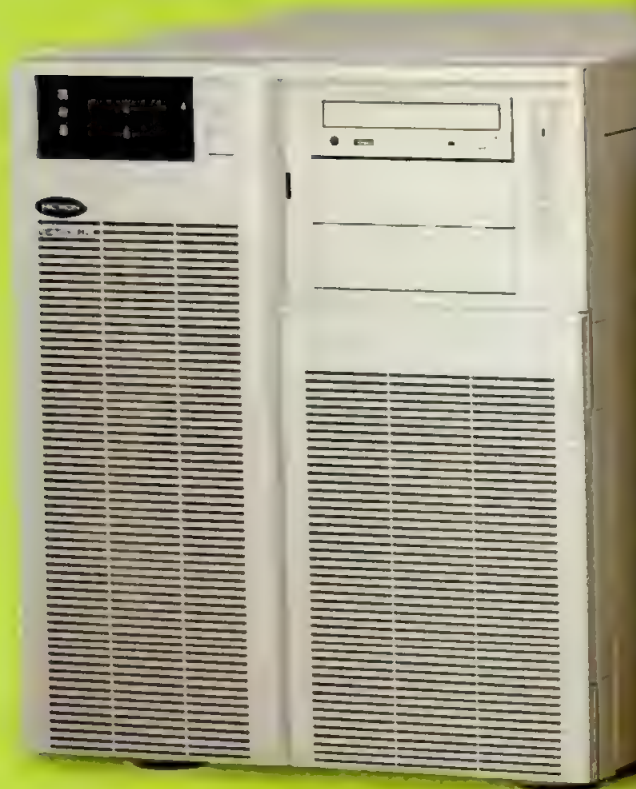


Call now to order.
800-707-2329
www.micronpc.com



CONFIGURED FOR YOUR LIFE
CALL US FOR MORE INFO

Like peas in a



The Micron Vetix and ClientPro® Series. Solutions for a healthy network.

Need solutions for your growing network?

If you can dish it out, our systems can take it. Our ClientPro PCs and Vetix servers effortlessly get your network running – and keep it running.

We pack our hardy Vetix MX1 chock-full of features, like redundant power supplies and high-degree, fault-tolerant components including swappable hard drives. And we made our entry-level LX1 models expandable, reliable and tough.

Complement your server with our ClientPro desktops. We've designed them to be easy to set up, easy to upgrade and easy to network. That means you reduce potential downtime and lower your total cost of ownership. And if you have networking questions – your answers are just a phone call away. That's what our unwavering customer support is all about.

This powerful pair makes networking easy. And that's a pretty sweet dish.

pod.



The Micron Powerdigm[™] sets a sizzling pace.

The Powerdigm XSU revolutionizes the workstation with Micron's engineered and developed Samurai[™] chipset. A powerful, Intel-processor based workstation, the Powerdigm XSU executes demanding business and technical tests with command, and it's flexible enough to run popular PC programs.

Micron is the only company to offer the innovative Samurai chipset. With support for dual monitors, dual Pentium[®] II processors, ultra-wide SCSI-3 and speedy 10/100 network adapters, the Powerdigm sizzles with features the competition is still dreaming about. You'll see the results in graphic design, digital imaging, financial analysis, CAD and more. The Powerdigm XSU, featuring the new Samurai chipset, takes workstation performance to new levels with 66MHz/64-bit PCI, enhanced memory and I/O subsystems.



PENTIUM[®] PRO
PROCESSOR

Call now to order.

800-707-2329

www.micronpc.com



CONFIGURED FOR YOUR LIFE

Extra hot.



The Micron Millennia[®] Series adds kick.

Our powerful new Millennia XKU packs a Pentium[®] II processor featuring MMX[™] technology, while the Millennia MME has a Pentium processor with MMX technology. Both offer 3D video, MPEG, and 24X EIDE CD-ROM and more - so you can dish up the most intense games and Internet sites.

If you want even more sizzle to your gaming experience, add our Fusion3D option, which includes DVD software, Monster 3D graphics card, AWE 64 PCI sound card and a two speaker satellite with a subwoofer stereo system, plus five intense multimedia computer games.

Now when you buy a Millennia, you can choose one of four feature-packed software bundles to be preinstalled in your system - at no extra cost!

Quicken Financial helps you organize personal finances — from money management to estate planning. Young children learn lots from computer games with the **EdVenture Pack**. Fun titles, fun songs, fun games ... and lots of learning. Get your fill of intense multimedia and entertainment applications with the **Multimedia Xcitement** package - call for current titles and details. And the **Home Productivity Pak** offers games and reference tools for the entire family.

One of these four packages is standard with your new Millennia. Additional bundles are only \$69 each, as is the upgrade to our Academic Bundle, which includes useful references and information for students.

Or, upgrade to our Small Business Essentials package for only \$249. This must-have bundle for small businesses includes titles you can use every day.

Hot enough for you?



MICRON™ MILLENNIA® Xku

Intel 300MHz Pentium® II processor
(features MMX™ technology)
128MB SDRAM
8.1GB Ultra ATA hard drive
17" Micron 700FGx, .26dp (16.0" display)

STANDARD FEATURES

82440LX chipset
512KB internal L2 cache, 2MB BIOS
100MB Iomega Zip drive, 3.5" floppy drive
24X EIDE variable speed CD-ROM drive
32 voice wavetable stereo sound, powered speakers with subwoofer
USR Sportster 56K x2 data/fax modem**
AGP 128-bit 3D video with 4MB SGRAM
Microsoft® Intellimouse™, USB connections
Microsoft Windows® 95 and MS® Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3-year Micron Power™
limited warranty

\$3,999

Bus. Inoue \$140/mo.

MICRON MILLENNIA MME 200

Intel 200MHz Pentium processor with MMX technology
48MB SDRAM
4GB Ultra ATA hard drive
17" Micron 700FGx, .26dp (16.0" display)

STANDARD FEATURES

512KB pipeline burst cache, flash BIOS
3.5" floppy drive
100MB Iomega Zip drive
24X EIDE variable speed CD-ROM drive
32 voice wavetable stereo sound with speakers
USR Sportster 56K x2 data/fax modem**
PCI 64-bit 3D video, MPEG, 4MB EDO DRAM
Microsoft Intellimouse, USB connections
Microsoft Windows 95 and MS Plus!
Microsoft Office 97 Small Business Edition
Choice of Micron Software Solutions Pak
5-year/3-year Micron Power
limited warranty

\$2,299

Bus. Inoue \$78/mo.

MICRON MILLENNIA Lxe 166

Intel 166MHz Pentium processor with MMX
16MB EDO RAM
3.2GB EIDE hard drive
15" Micron 500FGx, .28dp (13.7" display)

STANDARD FEATURES

512KB pipeline burst cache, flash BIOS
3.5" floppy drive
16X EIDE variable speed CD-ROM drive
16-bit stereo sound and speakers
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
Microsoft Mouse, USB connections
Microsoft Windows 95 and MS Plus!
Microsoft Works
Choice of Micron Software Solutions Pak
5-year/3-year Micron Power
limited warranty

\$1,499

Bus. Inoue \$56/mo.

MICRON SOFTWARE SOLUTIONS PAKS*

Quicken Financial Pak: Quicken Deluxe 6, Family Lawyer, Parent's Guide to Money, Financial Planner
EdVenture Pak: Thinkin' Things #2, Sheila Rae The Brave, Reader Rabbit's Reading #1, Freddie Fish: Missing Kelp Seeds, Putt-Putt Saves the Zoo
Multimedia Xcitement Pak: (MMX enhanced titles, call for details)
Home Productivity Pak: Family Doctor, Comptons Encyclopedia 1997, Mavis Beacon Teaches Typing, Printshop Ensemble, Net Nanny, Crayola Magic 3D
Academic Bundle: Merriam Webster's Collegiate, Word Smart, Groliers Encyclopedia, Student Reference Library, Quicken SE, Hoyle Classic Games

Choice of one Solutions Pak with purchase of Millennia system. Pick an additional bundle for only . . .

\$69

MICRON FUSION3D OPTION PAK

DVD-ROM*, DVD software
E4 Cool DVD PCI decoder card: 6 channel AC-3 2 channel out capability, SPDIF output (digital audio out)
AWE 64 ISA sound card
Cambridge SoundWorks/MicroWorks
2 speaker satellite with subwoofer stereo system
Monster 3D graphics card with 4MB memory
Fusion3D game pak:
Mech Warrior 2; Mercenaries 3Dfx version, AH-64 Longbow,
U.S. Navy Fighters '97, Command & Conquer, Popular 3Dfx Racing Sim
Microsoft Sidewinder Pro joystick

Available on Millennia Mme and Xku systems only.

Xku add **\$649**

Mme add **\$699**

The CD-ROM drive will be removed upon the purchase of the DVD upgrade.
Maximum transmission speed of up to 55Mbps when downloading data and 33Mbps when uploading. However, actual performance is dependent upon numerous factors and transfer rates may be less than the maximum potential.
Available only on Millennia systems with Microsoft Windows 95.

Call now to order.
800-707-2329
www.micronpc.com



CONFIGURED FOR YOUR LIFE



MICRON VETIX LXI-N SERVER

Intel 200MHz Pentium Pro processor
 32MB ECC EDO RAM
 2GB Ultra Wide SCSI-3 hard drive
 15" Micron 15FGx, .28dp (13.7" display)

STANDARD FEATURES

Dual Pentium Pro ZIF sockets
 256KB integrated L2 cache
 Memory upgradable to 1GB (8 DIMM slots)
 5 PCI, 2 ISA, 1 shared ISA/PCI, 9 drive bays
 Integrated Adaptec PCI Ultra-Wide SCSI-3 controller
 Integrated Intel EtherExpress™ Pro 100 controller
 Integrated SVGA graphics
 12X SCSI-2 CD-ROM drive
 3.5" floppy drive
 Dedicated server technical support, 7x24
 5-year/3-year Micron Power limited warranty
 1-year next-business-day on-site service†

\$2,999

Bus. lease \$102/mo.

†On-site service for the Vetix server is provided by Digital Equipment Corporation and is optional.

MICRON VETIX Mx1 SERVER

Intel 200MHz Pentium Pro processor
 128MB ECC EDO RAM
 Three 4GB Ultra-Wide SCSI-3 hard drives (12GB total)

STANDARD FEATURES

256KB integrated L2 cache
 Dual Pentium Pro ZIF sockets
 Memory upgradable to 1GB (8 DIMM slots)
 8 open expansion slots: 5 PCI, 2 ISA, 1 shared ISA/PCI
 Integrated Adaptec PCI Ultra-Wide SCSI-3 controller
 Integrated Intel EtherExpress Pro 100 controller
 12X variable speed SCSI CD-ROM drive
 5 internal, hot-swappable, hard drive array bays
 (upgradable to 10)
 3 external 5.25" media bays
 1 (one) 330 watt power supply standard
 (upgradable to 3 for added redundancy)
 Microsoft Windows NT Server 4.0 (10-user license)
 Intel LANdesk Server Manager 2.52
 Dedicated server technical support, 7x24
 5-year/3-year Micron Power limited warranty
 1-year next-business-day on-site service†
 NOS Support (3 incident resolutions/
 1st year), 7x24

\$7,999

Bus. lease \$251/mo.

MICRON TRANSPORT Xpe

150MHz Mobile Intel Pentium processor with MMX
 32MB EDO RAM (80MB max)
 1.4GB removable hard drive
 12.1" active matrix color display, 800x600

STANDARD FEATURES

256KB L2 pipeline burst cache
 PCI graphics accelerator, 2MB VRAM
 8X modular CD-ROM drive
 Pick-a-Point™ dual pointing devices
 Microphone and 16-bit stereo sound
 Motorola Montana 33.6 fax/modem
 CardBus- and zoomed video-ready
 2 infrared ports, S-video, NTSC, game port
 Management and Executive Travel software pak
 2 modular expansion bays
 Custom nylon carrying case
 Microsoft Windows 95 and MS Plus!
 Microsoft Office 97 Small Business Edition CDs
 5-yr/3-yr Micron Power
 limited warranty

\$3,499

Bus. lease \$119/mo.

MICRON TRANSPORT Xke

233MHz Mobile Intel Pentium processor with MMX
 48MB EDO RAM
 3GB removable hard drive
 13.3" TFT XGA display

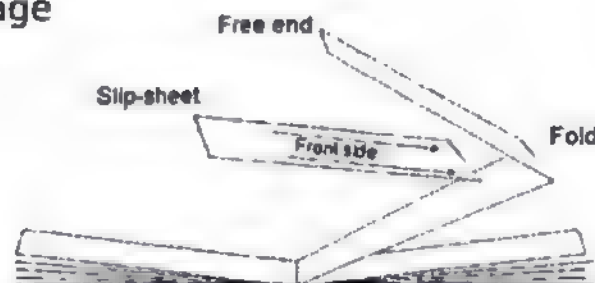
STANDARD FEATURES

512KB L2 pipeline burst cache
 128-bit 2MB DRAM graphics
 20X modular CD-ROM drive with AutoPlay™ technology
 Pick-a-Point dual pointing devices
 Microphone and 16-bit stereo sound
 Integrated 33.6 modem, full duplex
 CardBus- and zoomed video-ready
 2 infrared ports, S-video, NTSC, game/MIDI port, USB
 Management and Executive Travel software pak
 2 modular expansion bays
 Custom nylon carrying case
 Microsoft Windows 95 and MS Plus!
 Microsoft Office 97 Small Business Edition CDs
 5-yr/3-yr Micron Power
 limited warranty

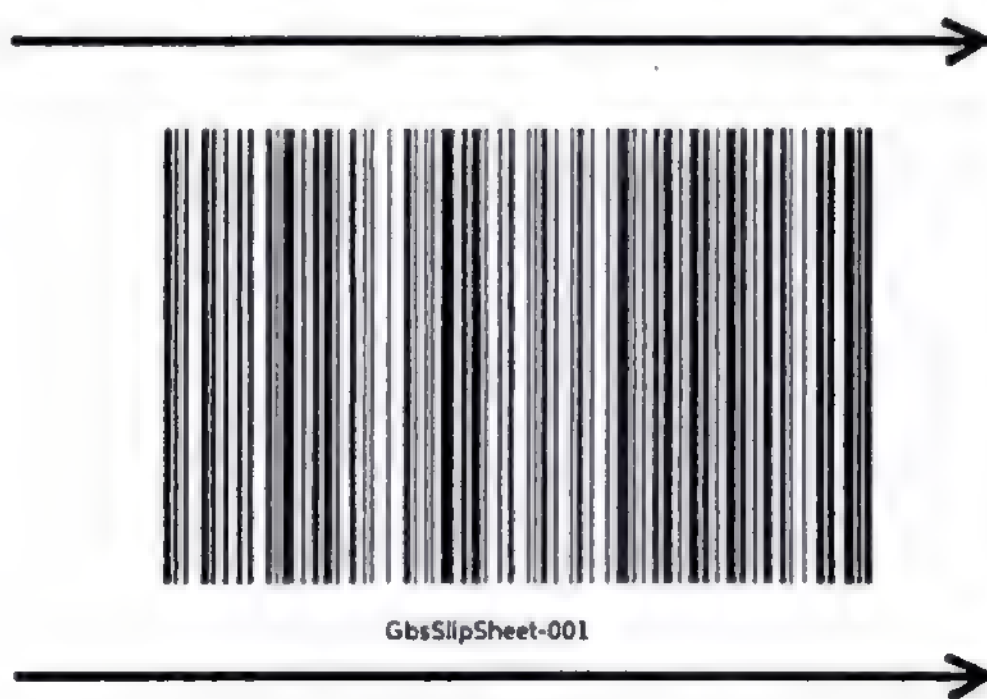
\$5,899

Bus. lease \$185/mo.

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

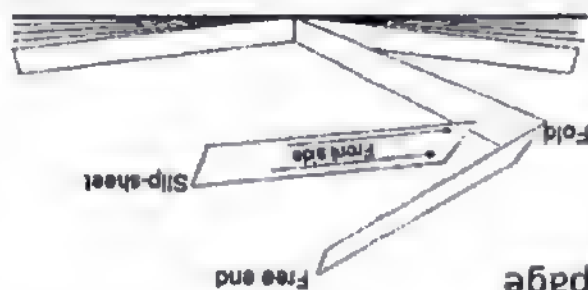


Foldout slip-sheet



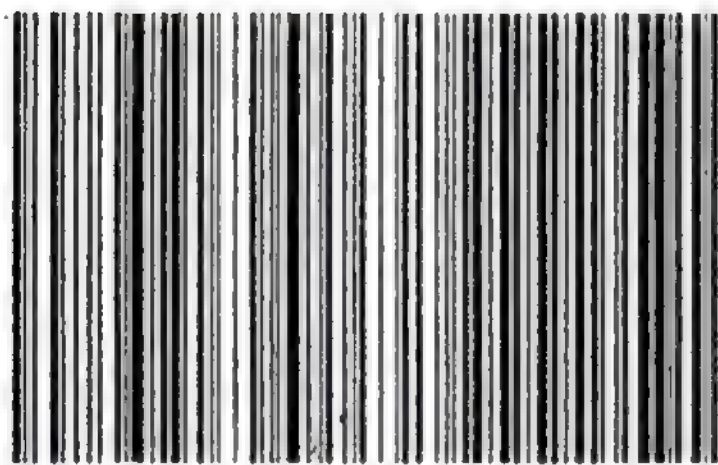
Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



GbsSlipBack-0018

Back

1. Follow instructions on the other side

Sweet deals.

MICRON CLIENTPRO MTE

Intel 166MHz Pentium processor with MMX technology
32MB EDO RAM
2.1GB SMART EIDE hard drive
15" Micron 500FGx, .28dp (13.7" display)

STANDARD FEATURES

512KB pipeline burst cache, flash BIOS, DMI Support
3.5" floppy drive
3Com 3C905 network adapter
Integrated S3 ViRGE/DX graphics accelerator, 2MB EDO RAM
Integrated wavetable sound
Tool-free minitower or desktop
Microsoft Intellimouse
Microsoft Windows 95
Intel LANDesk[®] Client Manager
5-year/3-year Micron Power limited warranty

\$1,549

Bus. Incoe \$53/mo.

MICRON CLIENTPRO XLD

Intel 233MHz Pentium II processor with MMX technology
32MB EDO RAM
2.1GB SMART EIDE hard drive
17" Micron 700FGx, .26dp (16.0" display)

STANDARD FEATURES

512KB internal L2 secondary cache, DMI support
3.5" floppy drive
16X EIDE variable speed CD-ROM drive
3Com PCI 10/100 ethernet NIC
PCI 64-bit 3D video, MPEG, 4MB EDO RAM
Upgradable wavetable audio with speakers
Microsoft Intellimouse
Microsoft Windows NT Workstation
Intel LANDesk Client Manager
5-year/3-year Micron Power limited warranty

\$2,549

Bus. Incoe \$87/mo.

MICRON POWERDIGM Xsu

Dual Intel 300MHz Pentium Pro processors
64MB ECC SDRAM
Fire GL 1000 pro 8MB 66MHz PCI Open GL Professional 3D accelerators
4GB Ultra-Wide SCSI-3 hard drive
19" Hitachi SuperScan CM75L (18" display), .26dp color monitor

STANDARD FEATURES

12/20 variable speed SCSI CD-ROM drive
Memory upgradable to 1GB ECC SDRAM
Supports multiple Ultra-Wide SCSI-3 hard drives
DMI, software and hardware management support
Iomega Jaz SCSI drive with 1GB removable cartridge
Wavetable stereo sound with speakers
Fast Ethernet 10/100 PCI network adapter
Microsoft Intellimouse
Microsoft Windows NT[®] Workstation
5-year/3 year Micron Power limited warranty

\$6,199

Bus. Incoe \$195/mo.

MICRON TRANSPORT VLX

133MHz Intel Pentium processor
16MB EDO RAM (40MB max.)
1.4GB hard drive
16X modular CD-ROM drive
Li-Ion battery
12.1" TFT SVGA, 800x600 display

STANDARD FEATURES

256KB L2 pipeline burst cache
PCI bus with 128-bit graphics accelerator
MPEG compatible
Zoomed video-ready
Touchpad pointing device
Microphone and 16-bit stereo sound
2-way infrared port
Modular floppy drive
Microsoft Windows 95 and MS Plus!
5-year/1-year Micron limited warranty

\$2,249

Bus. Incoe \$71/mo.

Appealing options.



MULTIMEDIA OPTIONS

AWE 64 ISA Sound card upgrade	\$99
Advent AW270 Powered Partners stereo speakers	\$79
Advent AW370 Powered Partners stereo speakers with subwoofer	\$199
Microsoft SideWinder 3D Pro joystick	\$59
Microsoft SideWinder gamepad	\$39

STORAGE/MEDIA OPTIONS

Adaptec 2940U Ultra SCSI Fast-20 controller	\$100
upgrade from system with standard Ultra SCSI Fast-20 controller.	
Plextor 12/20 Plex 3MB/sec SCSI internal CD-ROM drive	\$100*
upgrade from system with standard EXIDE CD-ROM drive	
Iomega Iaz SCSI drive with 1GB removable cartridge	\$299*
Iomega ZIP IDE drive with 100MB removable cartridge	\$99
Iomega 6-pack of 100MB Zip cartridges	\$99
Iomega 3-pack of 100MB Zip cartridges	\$49
Sony 4/8GB SCSI DDS-2 tape backup drive with tape and software	\$899
Cheyenne ARCserve with InoculAN (for servers)	\$499
Mytek dual channel Ultra-Wide SCSI-3 RAID caching controller with 4MB ECC RAM	\$899

COMMUNICATION OPTIONS

33.6 external data/fax modem	\$299
56Kbps technology modem*	\$99

NETWORKING OPTIONS

3Com 3C509B Etherlink III ISA combo network adapter	\$79
3Com 3C900 EtherlinkXL PCI combo network adapter	\$99
3Com 3C905 Fast EtherlinkXL 10/100 PCI TPQ network adapter	\$99
3Com OfficeConnect Hub 8/TPC	\$149
3Com OfficeConnect Switch 140	\$969

SOFTWARE OPTIONS

Small Business Essentials: QuickBooks, Visio, Norton AntiVirus, Astound, Focal Point, American Yellow Pages	\$249
CorelDRAW 7 full retail version	\$299
Corel WebMaster Suite full retail version	\$99
Norvell Intranetware 4.11, S-user license, for Web L2-a only	\$699

HP PRINTERS

HP Deskjet 682c printer	\$319
HP Deskjet 870Cxi printer	\$419
HP LaserJet 6Lxi printer	\$429
HP LaserJet 6P printer	\$799

DISPLAY/VIDEO OPTIONS

17" Hitachi SuperScan CM630 (15.9" display) .26dp color monitor	\$100*
21" Hitachi SuperScan CM80L (20.0" display) .26dp color monitor	\$650*
Number Nine Imagine 128 series II video card, 4MB VRAM	\$299*
Number Nine Imagine 128 series II video card, 8MB VRAM	\$549*

TRANSPORT OPTIONS

MicronDock™ multimedia port replicator: ethernet 10BT LAN adapter, SCSI-2 port, S-video and NTSC-video output, built-in stereo speakers, infrared port, headphone, microphone, line-in jacks, parallel, serial, VGA and 2 PS/2 ports (with warm dock and built-in game port - available on XPE models only)	\$299
Micron Executive™ desktop package: matching black 17" monitor (16.0" display), mouse, mousepad and keyboard (can be used with or without MicronDock)	\$699
Motorola Montana 33.6 fax/modem supports regular telephone connections, cellular phones and two-way paging devices	\$259

SCANNER OPTIONS

HP Scanjet 5s sheetfed scanner	\$209
HP Scanjet 5p flatbed scanner	\$309
HP Scanjet 4c flatbed scanner	\$759

DESKTOP EXTENDED SERVICE OPTIONS

Optional 1st year on-site service* coverage included	
2nd year on-site service* coverage	\$79
2nd and 3rd year on-site service* coverage	\$99

Other service options may be available, ask your system consultant

SERVER EXTENDED SERVICE OPTIONS

2nd and 3rd year next-business-day* on-site service coverage*	\$99
4-Hour response* on-site service coverage* (8am-5pm, M-F), 3 years total	\$798
4-Hour response* on-site service coverage* (24-hours, 7 days per week), 3 years total	\$998

Other service options may be available, ask your system consultant

NOTEBOOK EXTENDED SERVICE OPTIONS (US only)

2nd and 3rd year parts and labor*; 3-business-day turnaround for 3 years	\$269
2nd and 3rd year parts and labor*; 7-business-day turnaround for 3 years	\$209

OTHER OPTIONS

APC Per7T surge suppressor	\$39
APC Pro7T surge suppressor	\$59
APC Smart-UPS 700 with PowerChute plus software	\$389
APC Smart-UPS 1000 with PowerChute plus software	\$529
Microsoft Natural Keyboard upgrade from standard keyboard	\$49

* Requires SCSI host adapter
 Upgrade from system with standard Micron 17" 700Hz 16" display color monitor
 † Upgrade from system with standard 486/33MHz 4MB cache card
 ‡ Int'l on-site service is available in the United States and in limited areas in Canada from third-party service provider per customer's requirements with exception
 § 2nd year and 2nd and 3rd year offerings are available in the United States only. Extended services, if purchased after system shipment may have a higher cost.
 ¶ Services will be scheduled, whenever possible, for the next business day after parts are furnished to the customer.
 †† Available in certain locations, ask your system consultant for details.
 Some options and accessories available with system purchase only

* Available only on desktop and notebook systems with Microsoft Windows 95.
 † Maximum transmission speed of up to 56Kbps when downloading data and 33.6Kbps when uploading.
 ‡ However, actual performance is dependent upon numerous factors and observed transfer rates may be less than the maximum potentials.

MICRON POWER WARRANTY

5 year limited warranty on microprocessor and main memory
 3-year limited parts-only system warranty, 1 year for Transport Vx/i
 1, 2 or 3 year optional on-site service agreement for Micron desktop and server systems
 30 days of free Micron-supplied software support for Micron desktop systems, 3 optional network operating system incident resolutions included for Micron server systems
 30 day money-back policy
 24 hour technical support
 The foregoing is subject to and qualified by Micron's standard limited warranties and terms and conditions of sale. Terms and conditions of sale may vary for specific configurations. Copies of the limited warranties may be obtained on our Web site or by calling Micron.



Micron Sales Hrs: Mon-Fri, 6 am-10 pm,
 Sat, 7 am-5 pm (MT) Technical Support
 Available 24 Hours A Day, 7 Days A Week
 Toll free from Mexico: 95-800-708-1755
 Toll free from Canada: 800-708-1758 • Toll free from
 Puerto Rico: 800-708-1756 • International Sales:
 208-893-8970 • International Fax: 208-893-7393

Call now to order.
 800-707-2329
 www.micronpc.com



© 1997 Micron Electronics, Inc. All rights reserved. Micron Electronics is not responsible for omissions or errors in typography or photography. All purchases are subject to availability. Prices and specifications may be changed without notice; prices do not include shipping and handling and any applicable taxes. 30-day money-back policy does not include return freight and original shipping. Handling charges, applies only to Micron brand products and begins from date of shipment. All sales are subject to Micron Electronics' current terms and conditions of sale. Lease prices based on 36-month lease. The Intel Inside Logo and Pentium are registered trademarks and MMIO is a trademark of Intel Corporation. Microsoft, Windows, Windows NT and the Windows logo are registered trademarks of Microsoft Corporation. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.

CONFIGURED FOR YOUR LIFE

First Looks

ORGANIZED VIEW: *TripMaker Deluxe* displays maps, directions, and trip summary windows.

complete with travel tips and articles, currency conversions, weather condition and forecast features, and the ability to make online reservations—is impressive in its depth and organization. You have to register online to make reservations via Expedia, but the ease, speed, and flexibility of the reservation system is a compelling argument for Web-based travel arrangements.

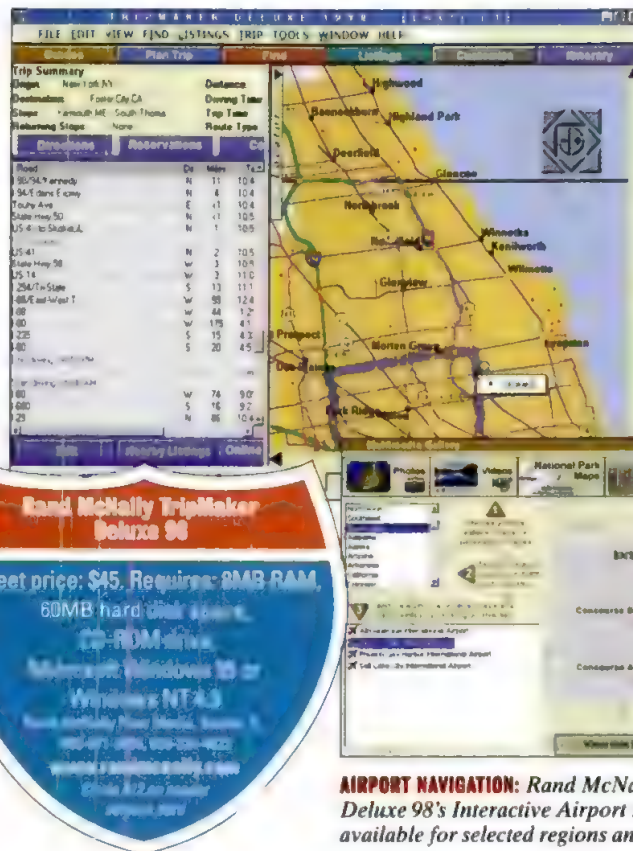
Microsoft Expedia Trip Planner 98 is a convenient routing program with comprehensive destination and location content. It's also the most powerful online travel information and reservation system in this roundup.

Rand McNally

Rand McNally TripMaker Deluxe 98

The standard edition of Rand McNally TripMaker 98 (\$25 street price) adds greater routing flexibility to earlier versions, including ways of determining the quickest, shortest, and most-scenic routes plus searchable city street maps for 82 urban areas, highway exit information, and hotel and restaurant listings by price category. The pumped-up TripMaker Deluxe 98 (\$45 street), our Editors' Choice in this roundup, goes even further, adding an abundance of features that make the upscale edition worth the extra cost for both business and pleasure travel.

One of the high points of TripMaker Deluxe is the Mobile Travel Guide's series of seven regional editions of accommodation and restaurant guides. You can plan fly/drive itineraries that incorporate airline, hotel, and rental car information from reservations that you make using TripMaker's Reservations Online service.



Exit service information lets you display only those exits that offer the services you want, such as any available fast-food restaurants.

The TripMaker Deluxe Parents' Corner includes information about child-friendly attractions, accommodations, and eating establishments. There are also paper-based activities and car games that can be printed ahead of time for use on a trip. And in case you get lost, TripMaker Deluxe now has GPS support (with a choice of two GPS displays).

The new city and town street information built into TripMaker Deluxe adds significant value when traveling. You can't plan trips by using street addresses, but you can put pins on the map to mark stops. Also, street data isn't available when you're traveling in remote or rural areas, but it can be very helpful for reference purposes and for tracking with a GPS. The data is

also searchable by address, with viewing granularity that extends down to the block level.

The frontier-garbed cartoon guide found in earlier versions of TripMaker is gone, replaced by a cleaner interface. Audio prompts are still the default setting, but you can turn them off with a single click. TripMaker's opening screen guides you through selecting an origin, destination, and different stops along the way. You can also enter extensive personal-profile settings, including such fine points as whether to display attractions of interest to children on your itinerary. While using a new sliding zoom control or "+" and "-" buttons to adjust the zoom level, you can also use a very convenient map navigation and zooming rose—arguably the best interface solution out of all the packages tested here for moving around the entire screen.

The screen can be split horizontally and vertically between directions and maps. The maps

are quite attractive, and the print in the directions is clear and easy to read. Route preferences can be set to the individual road segment, with specific segments set to be preferred or avoided.

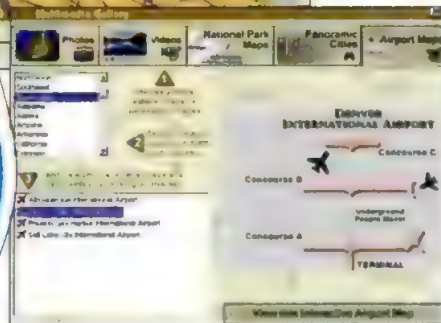
As has previously been the case, TripMaker Deluxe has the most extensive travel information database (included on the disk); it offers more multimedia options than the others. It's the only package here that includes video clips. The Multimedia Gallery lets you select from photos, videos, national park maps, panoramic city shots, and interactive airport maps for selected states and regions. The airport maps are useful, showing terminals, access to main roads, plus restaurants and accommodations near the airport.

The national park maps also have excellent detail, and video clips are available for most of the major parks.

TripMaker Deluxe's Web site information is extensive, with weather updates, currency converters, and sections devoted to parents, business travelers, and special events (these can be accessed by clicking on different regions of a U.S. map). The Internet Directory, designed by Rand McNally, lets you search by state and then select by attraction type. The search results list links to the site or the attraction's own specific Web site.

Other online features include travel articles and highlights of special-destination events. Discussion forums are also maintained for budget-minded travelers, family travelers, and RV and camping enthusiasts; users can also write their own restaurant reviews. With TripMaker's Internet construction link, the current route can be automatically modified to avoid delays.

AIRPORT NAVIGATION: Rand McNally TripMaker Deluxe 98's Interactive Airport Maps are available for selected regions and states.



LAND
ON THIS,
FLYBOY.

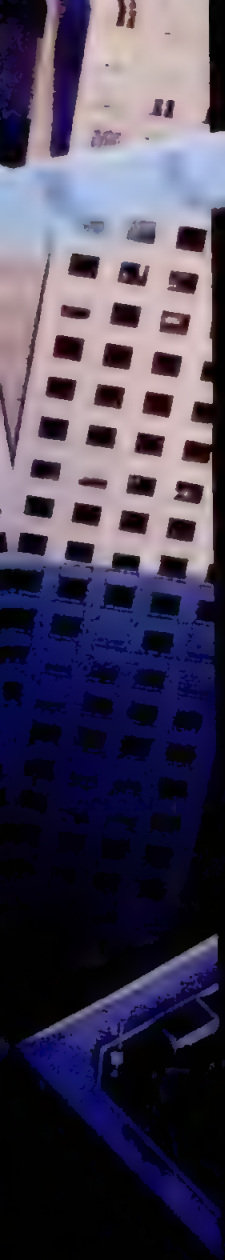
Microsoft
do you want to go today?



Endorsed by:
FlightSafety
International



BOEING BUSINESS AIRCRAFT



Look here ace, you've got just 90 feet of runway before you earn your wings the hard way. Face it. Your fixed-wing rules do not apply here. What you need is a helicopter. And now you've got one in Microsoft® Flight Simulator 98, the most



significant upgrade of this product ever. With it you'll soar over painstakingly detailed landscapes that include 3000 airports (10 times more than the previous version) and more than 45 cities around the world. Flight Simulator 98 supports multiplayer and

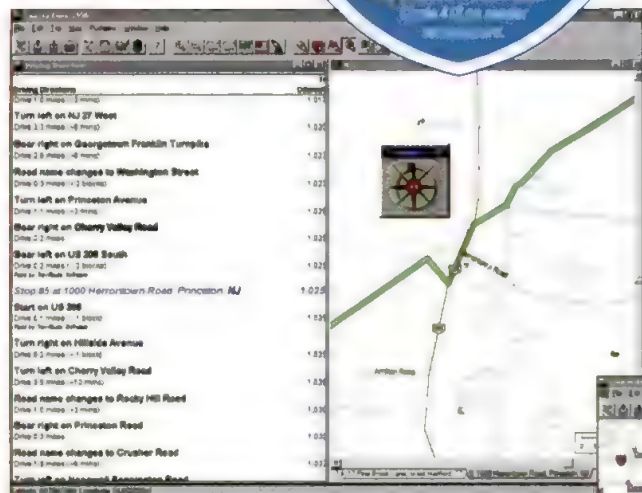
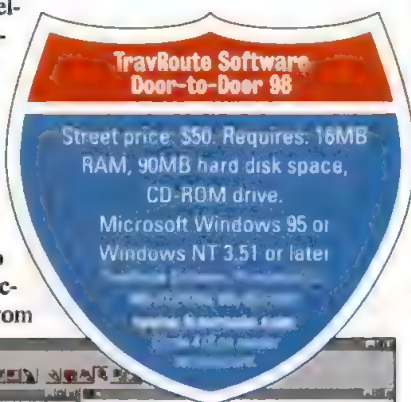


force feedback technology so you can achieve all new levels of flight realism. Take control of the widest range of aircraft, including this Bell 206B JetRanger III helicopter, a machine that's guaranteed to make you feel like a rookie all over again.

Your coordinates for take off are www.microsoft.com/games/fs98

First Looks

Whether you are traveling for business or pleasure, Rand McNally's new TripMaker Deluxe 98 is packed with helpful features and information. The basic feature set is available with the standard edition, but anyone who travels more than just occasionally will benefit from



ON TRACK: Door-to-Door 98 splits the screen between directions and street maps, with a compass rose to keep you on course.

the extra functions offered in the Deluxe version.

TravRoute Software Door-to-Door 98

TravRoute Software's Door-to-Door 98 is the only package here that includes a complete U.S. street atlas with its trip-planning and routing program. Although the other three programs can display—and to some degree plan—routes along streets in major urban areas, Door-to-Door covers the entire U.S. This feature makes it much more valuable for business travelers who need to call on multiple stops and don't want to load other software or use other resources for local directions.

The tradeoff here is that Door-to-Door isn't in the same league for travel and tourism information as the Delorme, Microsoft, and Rand McNally products (although TravRoute

does offer a growing set of Web-based travel and destination links and tools). The least likely program to choose for planning vacation travel, Door-to-Door is still the top choice for business trips.

Door-to-Door's 95 million residence and business addresses let you generate turn-by-turn directions with great accuracy. During testing, the program took the longest to calculate the 12-stop trip thanks to street-level granularity, but it was still under 2 minutes. Door-to-Door could not locate 320 Lakeside Drive in Foster City—the street wasn't in the program's database. We had the same problem when we tried to find Delorme Drive, Gateway Drive, or Microsoft Way. Although the street address capability isn't perfect (TravRoute even states

that it isn't 100 percent accurate), the level of available routing specifics far exceeds those of the other programs.

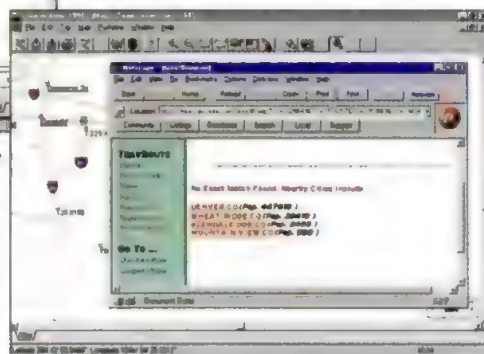
When the program can't find a unique street address, you can still specify the city or town name. If you can find a nearby location by zooming in on the map view, you can manually add a custom pushpin marker that can be used for trip planning.

Personal-profile options include maximum speeds for eight types of roads, relative preferences for road types on a specific trip, and your choice of the quickest, shortest, or customized route (which uses your road-type preference data). You enter origin, destination, intermediate stops, and trip options via a simple-to-use trip window. In most instances, you enter city or place names and then select

the selected spot will appear. You can also annotate the maps with notes that can be saved or printed along with your itinerary.

Like the other programs here, Door-to-Door 98 lets you select an area on the map by having you draw a box around it; then the screen is quickly filled up with a larger, more-detailed image of that area. TravRoute's program zooms in and out with single steps. Pushpin sets of specific places or types of locations can be turned on and off via a pushpin management feature. This feature can be valuable for tracking significant location-based people or places. Pushpin sets can use any of 130 icon types, with data sets downloadable from TravRoute's Web site.

The TravRoute Internet content includes references to service stations, hotels, airlines,



SURF THE MAP: With Door-to-Door 98's Geo-Browser, you can bring up a list of nearby cities.

restaurants, car rental agencies, and weather updates. When you choose a city or state, preselected lists of local accommodations, restaurants, and services appear; when available, each list links directly to the Web sites for those locations. You can also surf the Web via a Door-to-Door map using the GeoBrowser cursor mode.

the proper zip code, followed by a valid street address. When you don't know or care about street-level addressing, you can use city or place names, including custom places you've entered yourself. An option box lets you choose round-trip routing.

After a planned trip is calculated, the screen is split between directions and maps. At the bottom of the map window, you'll find tabs for each stop you make. This provides a quick reference to maps of each place on your itinerary. These map and direction windows are uniquely interactive: If you click on any line in the directions list, a zoomed map of

When you point to locations on a map, your browser automatically accesses the TravRoute information and Web links for that region. The unique Web-based TravAgent program can find local travel-information sites for specific states based on the type of media (maps, audio, video, or text) you wish to see or hear.

TravRoute's Door-to-Door 98 doesn't have much vacation-oriented data and little on-disk travel information. But for business travelers who need a powerful program to calculate routes based on street addresses, this is the one to choose. **PC**

Rock & Roll isn't dead.

It's just **asleep**
in your garage.

Easy CD Creator
turns your scratchy
old LPs into
crystal clear CDs.

They don't make music like they used to, which is why we're introducing Easy CD Creator™ Deluxe Edition software. Now you can enjoy the power to clean up your old recordings and let you professionally digitize your music with any of today's CD Recordable drives. Dust off your old LPs, dig out your old cassettes, and let Easy CD Creator remove pops and scratches to uncover stunning clarity. Then immortalize it all on CD. You can even transfer photos, scanned images and Internet graphics to your personal CD. Or back up your hard drive and store important files. It's easy with Easy CD Creator Deluxe Edition. Order yours today. And start digitizing your records.

Because they don't make music like they used to.

Visit our site at www.adaptec.com/easycd/pcm

Only \$99^{MSRP}

Call 1-800-442-7274 ext. 2163.

Call now or visit your local Adaptec retailer.



adaptec

THE POWER FOR PERFORMERS THAT NEVER SAYS GOODBYE

© 1997 Adaptec, Inc. All rights reserved. Adaptec, the Adaptec logo and tag line, and Easy CD Creator software are trademarks of Adaptec, Inc., which may be registered in some jurisdictions. Our software is designed to assist you in reproducing material for which you own the copyright or have permission to copy from the copyright owner. *Suggested retail price U.S. dollars, subject to change without notice.

reality

business

"Build it and they will come,"
has been the Web's motto.

Great, but what if
they really show up?

www.pandesic.com/info/reality

Face it, once someone hits the "Purchase" button on your site, that's when the real work begins. Fortunately, there's the Pandesic™ internet business solution. Marrying the logistics experience of Intel and the business process expertise of SAP, it links everything together—from billing and accounting to inventory and shipping—so anything needed to fulfill an order, happens. The warehouse knows what to move. Billing has numbers. Everyone has realtime reporting. And it's automatic. Visit our site for more. Or call 1-888-349-ebiz, ext. 300. And next time someone visits your site, you'll know exactly what to do: business.

how a business does business



THE INTERNET BUSINESS SOLUTION

First Looks

NET PCs

Mini, Manageable Desktop

Compaq brings one of the first Net PCs to market with its affordable Deskpro 4000N.—By Carol Venezia

If maintaining near-total control over the PCs attached to your corporate LAN is a vastly appealing prospect, then the Net PC may be the answer to your prayers. Compaq Computer Corp. is one of the first companies to bring a Net PC to market with its Deskpro 4000N (\$1,300 street price).

The Net PC specification—announced by Intel and Microsoft earlier this year—purports to enable Windows-based PCs that are cheaper to maintain and far more controllable than full-blown Wintel PCs (for a more detailed story on the total value of ownership, see this issue's Net Tools section). But it's not the hardware that's of specific importance in this new platform—what matters here is manageability. Compaq has hit a home run on both counts with this machine.

CONFORMING TO SPEC

The Deskpro 4000N, in all respects, conforms to the Net PC specification. The system's chassis (which measures 3.5 by 12.5 by 14.5 inches, HWD) can be locked, sealed, or both, so you don't have to worry about rogue employees installing unauthorized hardware in their machines. Also per the Net PC spec, the Deskpro 4000N does not have a floppy disk drive, a CD-ROM drive, or ISA expansion slots.

The Deskpro 4000N also comes with an integrated, Net PC-compliant boot ROM. When hooked to a server that's loaded with the appropriate configuration software, the machine can boot over the network for automatic configuration of client software, such as an office suite or an e-mail package. Centralizing this task

frees the network administrator from running around with a fistful of CD-ROMs.

If you can't connect to the network because there's no software installed on the hard disk or the machine's hard disk fails, you can download a software utility from Compaq's Web site called the Compaq Floppy Driver Server. Using this utility, you can boot up the Deskpro 4000N from the floppy-disk drive of another PC by connecting the two with a serial-to-serial cable.

INSIDE THE BOX

Once you have unlocked the Deskpro's case, it's easy to get inside the unit for maintenance.

Just depress two buttons on either side of the case in front and slide the cover off. Inside is one of the cleanest designs we've ever seen. On top of a shelf in the front sits a 1.6GB hard disk. It isn't screwed in, so all you have to do to remove it is pick it up and unplug it. The drive shelf swings up and out of the way of the slide-out motherboard.

The unit's Compaq-designed motherboard houses a 200-MHz Pentium/MMX processor (166- or 233-MHz CPUs are also available), 32MB of synchronous DRAM (expandable to 256MB via two DIMM slots), and an S3 Trio64 V2/GX graphics chip set with 2MB of SGRAM. There's also a PCI slot located on a riser card that plugs into the motherboard.

To connect to your network, you can use an integrated Com-

paq Netelligent autosensing Fast Ethernet controller, which configures itself upon installation to operate on 10Base-T or 100Base-TX wiring. The Ethernet controller also supports Magic Packet technology, so you can wake up, boot up, or shut down the Deskpro 4000N from a remote location for off-hours servicing. Parallel, serial, VGA, mouse, and keyboard ports are located on the back of the machine along with two USB connectors. Including the time it takes to remove the cover, this machine strips down for servicing in a matter of seconds.

INTELLIGENT MANAGEABILITY

Like all Compaq PCs, the Deskpro 4000N includes Compaq's Enhanced Intelligent Manageability, a combination of hardware and software designed to make management easier. These

prefailure warranty.

The Deskpro 4000N also comes with Compaq's Insight Management Agent, which allows the machine to be managed over the network by a number of leading network management solutions (including HP OpenView, IBM NetView, Tivoli TME10, and Microsoft's SMS).

EVALUATING THE PLATFORM

The only question here is whether or not this device makes sense at this time, given that Microsoft's Zero Administration Initiation for Windows (ZAW) isn't fully available yet. Many of the first ZAW-related technologies will make their debut in Windows NT Workstation 5.0 and Windows 98, both scheduled for release early next year.

The answer depends entirely on your company's current needs and resources. If you do not mind deploying the hardware without the full software solution, the Deskpro (which supports ZAW) is a great choice if you need an efficient client PC to operate in a controlled network environment. But if you're reluctant to install the hardware without the total software solution,

or if you're afraid to try what is essentially an unproven platform (unproven in terms of whether or not it will really lower TCO), you might choose to wait to evaluate the platform further. No matter what category your company falls into, if you choose to travel the Net PC route, then the Deskpro 4000N should definitely be on your short list.

Deskpro 4000N. Street price: \$1,300. Compaq Computer Corporation, Houston, TX; 281-370-0670, 800-345-1518; www.compaq.com.

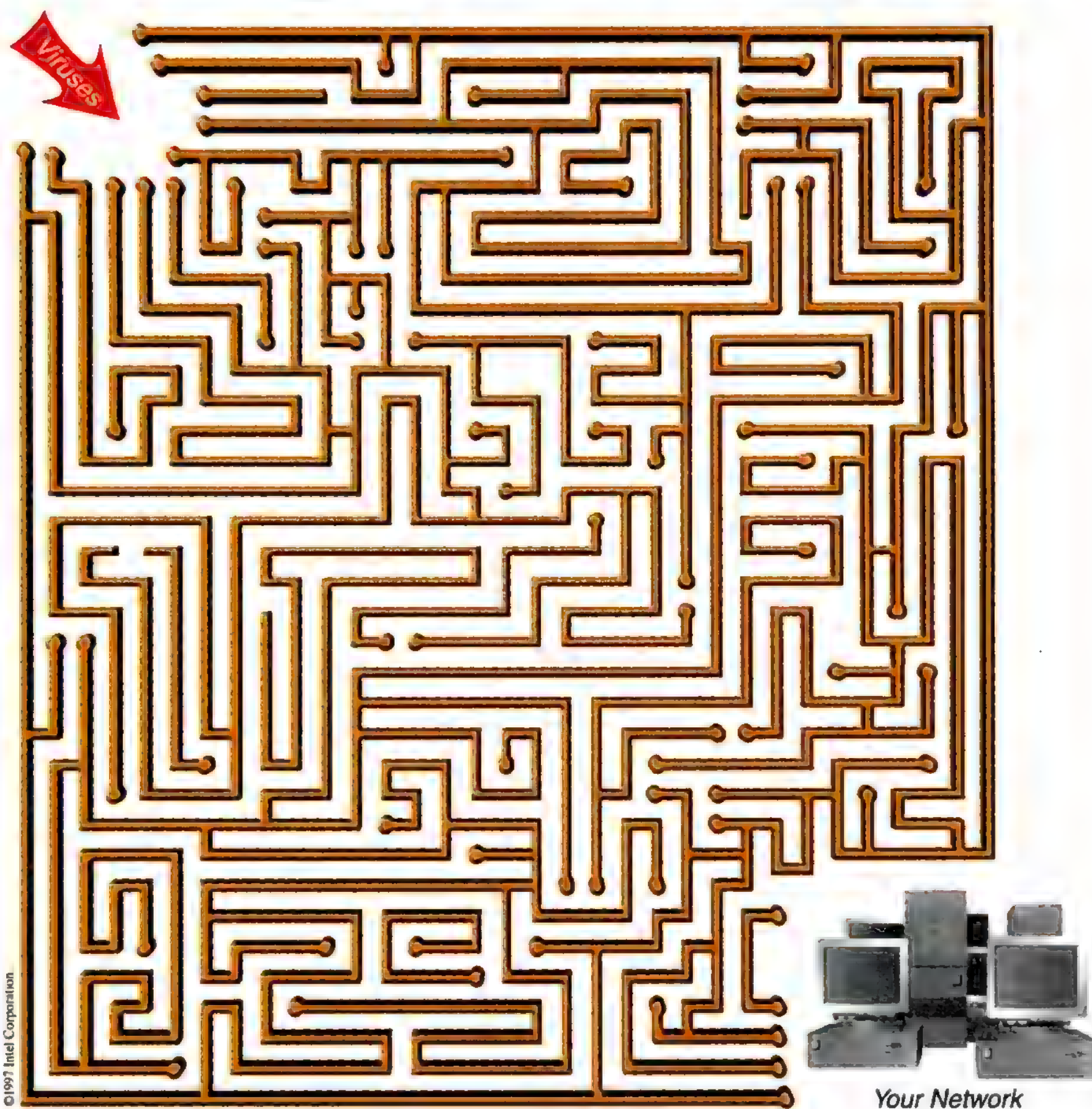


AFFORDABILITY: With a Pentium MMX/200, the 4000N is \$1,300.

management features are broken down into five major areas: configuration, assets, security, fault, and integration.

In addition to the extensive password-protection schemes, the system ports can be enabled or disabled to allow for even more control over what users plug into the device. In the fault-management category, the system comes equipped with a SMART II hard disk, which will report any impending failure; this component, among others, is covered by a

Frustrating viruses everywhere.



©1997 Intel Corporation

Multi-Layered Data Protection from Intel LANDesk® Virus Protect 5.0



Detection

The powerful scan engine in Intel LANDesk® Virus Protect provides continual detection of known and unknown viruses, including polymorphic, macro and stealth viruses.



Protection

The Integrity Shield is the industry's first technology to prevent the spread of viruses from an infected station to the server. Integrity Verification technology combines pattern scanning and integrity-checking functions so that no infected files remain on your server.



Central Control

Intel LANDesk Virus Protect provides true, centralized management with its multi-NOS, domain-wide configuration and maintenance, as well as single point control of client PCs and servers.

Create an impenetrable maze with multi-layer data protection. Intel LANDesk® Virus Protect 5.0 combines detection, protection and central control technologies to defend your data from every conceivable angle.

From our Web site, download a free **Intel LANDesk Virus Protect Test Drive Kit**. Or for more information, give us a call at 1-800-538-3373, extension 231, to find out what multi-layer virus protection can do for your network.

www.intel.com/network/LDVP.htm

intel®



Tim said, “100% Pure Java[™] programs give us the latest data from our intranet. So we can all work faster. We can have our products in the stores sooner.”

“And we can kick our rivals in the bottom!” said the boss.

Tim and the boss laughed.

“Ha, Ha, Ha!”

mul·ti·plat·form ac·cess

to·tal da·ta shar·ing

en·hanced pro·duc·tiv·i·ty



Pure and Simple.

*To see how leading banks, freight carriers and telecom firms use
100% Pure Java, visit <http://java.sun.com/100percent/benefits.html>
or simply call us at 1-800-JAVASOFT.*

BREWED BY



CIRCLE 335 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

First Looks

NOTEBOOK PCs

Heavyweight Lightweights

New lightweight, full-featured notebooks from Digital, Panasonic, and Sony.—By Melissa Perenson

It's no longer true that you have to give up features in order to reduce the weight of a notebook. Three fully equipped notebooks from Digital, Panasonic, and Sony are now redefining portability. Two hover around 5 pounds, and the third loads big features into a thin package.

DIGITAL HINOTE ULTRA 2000

Packing a big punch into a thin housing is nothing new for Digital Equipment Corp. But the latest in Digital's HiNote series, the HiNote Ultra 2000 VTX 5166M, breaks new ground by offering a 14.1-inch screen in a slim notebook—all for just \$6,000.

Designed for mobile power users, the HiNote Ultra 2000 features a 166-MHz Pentium MMX processor, 32MB of EDO DRAM (expandable to 144MB), 512K of L2 cache, and a Chips & Technologies 65554 graphics accelerator. The system is also equipped with a removable 2.1GB hard disk.

The gorgeous 14.1-inch XGA display sets this system apart from the pack, and it's all the more dramatic because the

system is just over an inch thick. At 7.5 pounds, the travel weight is heftier than previous HiNote Ultras, but this is the lightest notebook we've seen with such a big display.



A HIGH NOTE: The HiNote Ultra is slim at just over an inch thick (see inset) but has a 14.1-inch screen.

The system's keyboard is set flush with the back of the unit, leaving a 5-inch wrist rest in the front. The design accommodates two PC Card slots (one with Zoomed Video support) on the left side and a lithium battery that spans the notebook's width.

You can see the charging and

power lights from the front of the system. On the right side is a hot-swappable modular bay that accommodates either a 20X CD-ROM drive or a floppy disk drive. Integrated components include a 56.6-Kbps telephony modem, 16-bit stereo sound, and speakers.

At the back of the system are serial, parallel, VGA-out, Fast IR, PS/2, and RJ-11 ports. You can expand functionality with the \$899 (list) Multimedia Dock docking station or the \$379 (list)



Enhanced Port Replicator.

The HiNote posted test scores that are right on par with the average 166-MHz system reviewed in our August portables roundup. On our BatteryMark test, the HiNote lasted an impressive 3:29.

Whether you consider the screen, size, or sheer computing power, the Digital HiNote Ultra 2000 VTX 5166M is an exceptional portable.

Digital HiNote Ultra 2000 VTX 5166M. Street price: \$6,000. Digital Equipment Corp., Maynard, MA; 800-722-9332, 508-493-5111; www.windows.digital.com. Circle 402 on reader service card.

PANASONIC CF-35

If you're looking for a lightweight, rugged notebook, Panasonic's CF-35 (\$4,220 street) might just fit the bill. The system has a travel weight of 5.5 pounds and measures 1.6 by 11.6 by 9 inches (HWD). And with its magnesium LCD case, carbon-fiber-reinforced body case, and gel-mounted hard disk, the CF-35 is designed to weather the hard knocks of travel.

The CF-35 has a 150-MHz Pentium MMX processor, 16MB of EDO DRAM (expandable to 80MB), a 2GB hard disk, a NeoMagic NM2093 graphics accelerator, and 256K of L2 cache. The 12.1-inch SVGA active-matrix display supports resolutions up to 800-by-600.

The battery can be removed by sliding the door off and pulling on the battery's tab to draw it out of the system. Unfor-

INVINCIBLE: Panasonic's CF-35 is light yet rugged.



BENCHMARK TESTS

Notebooks



On our tests the Digital HiNote Ultra 2000 and the Sony PCG-707C outperformed the Panasonic CF-35 on the ZD Business Winstone 97 and ZD Business Graphics WinMark 97 tests. The Digital and Sony units performed equally on the ZD Business

Disk WinMark 97 tests, once again besting the Panasonic. The Panasonic's battery, however, outlasted the Sony's by 3 hours and the Digital's by 1 hour 13 minutes. Both the Digital and the Sony units we tested had 32MB of RAM; the Panasonic had 16MB of RAM.

	ZD Business Winstone 97 Score	ZD Business Graphics WinMark 97 Score	ZD Business Disk WinMark 97 Thousands of bytes/sec	ZD CD-ROM WinMark 97 Thousands of bytes/sec	ZD CPUmark ₃₂ Score	ZD BatteryMark 2.0 Hours minutes
Digital HiNote Ultra 2000 (1,024 x 768)	35	54	699	892	346	3:29
Panasonic CF-35 (800 x 600)	28	53	553	741	285	4:42
Sony PCG-707C (1,024 x 768)	37	59	699	881	349	1:43
	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶	BETTER ▶

tunately, the door is unattached, so it can be easily lost.

The CF-35 also has a modular bay that accepts a floppy disk drive or a 10X CD-ROM drive. The floppy disk drive is self-encased, so you can easily use it externally via the floppy drive port. On the right side of the system, you'll find access to the hard disk and two PC Card slots. Although the Windows 95 keyboard is adequate, the unit's touchpad is tiny. At the rear of the system is a selection of ports, including parallel, video-out, serial, USB, PS/2, microphone, headphone, and infrared.

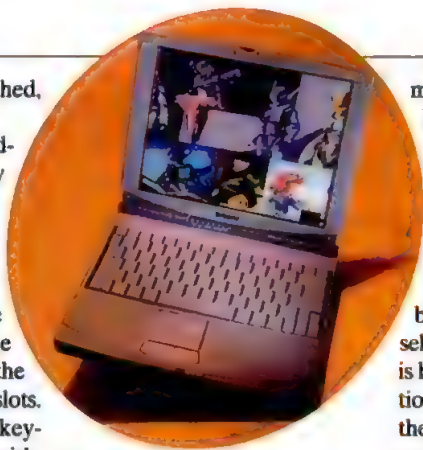
On our benchmark tests, the CF-35's scores were right on par with like-configured subnotebooks tested in our August portables roundup. The unit lasted an awesome 4:42 on our BatteryMark test.

For a well-built system that stands the test of road warriors, the Panasonic is a good choice. **Panasonic CF-35.** Street price: \$4,220. Panasonic Personal Computer Co., Secaucus, NJ; 800-662-3537, 201-371-9000; www.panasonic.com/ruggedPC. Circle 403 on reader service card.

SONY PCG-707C

Following its successful entry into the desktop PC market, Sony has entered the notebook market with its PCG-707C. The Sony PCG-707C builds on the mission that Sony established with its VAIO desktop line: converging PC and consumer electronics technologies.

Housed inside the gray-and-lavender chassis is a 166-MHz MMX Pentium CPU, 32MB of SDRAM (which is expandable to 128MB), a 2.1GB hard disk, 256K of L2 cache, and a NeoMagic NM128XD graphics chip set. The stereo speakers are located beneath the 12.1-inch XGA active-matrix display. A modular bay accommodates a 14.5X CD-ROM drive, a floppy disk drive, or a second battery; the floppy can also be used ex-



NEW GROUND: Sony enters the notebook world with the PCG-707C.

ternally. Two PC Card slots are also present; one of them supports Zoomed Video.

The PCG-707C measures 1.5 by 11.8 by 9.4 inches (HWD) and has a travel weight of 6.8 pounds. Instead of using the two-step catch-release design for removing components, Sony has incorporated the release into the removable components (battery, hard disk, CD-ROM, and floppy

modules). For example, the hard disk's cover doubles as the grip that actually pulls out the hard disk.

The keyboard and touchpad gain an ergonomic tilt when the snap-down feet are in place. Minor design drawbacks lie not in the notebook itself but in the power brick, which is hefty 5.6 inches long. In addition, the catch release that opens the unit is awkwardly placed.

Included with this notebook are remote-control earbud headphones—the same kind that typically come with high-end Sony Walkmen. The remote makes it easy to use the CD-ROM drive to listen to audio, even when the system isn't turned on.

The PCG-707C also features an integrated 33.6-Kbps modem with speakerphone support. The rear ports are clearly labeled in plain English, and they are even color-coded; unfortunately, the doors shielding the ports break off very easily. There's a complete

array of standard and multimedia ports, including NTSC and PAL video output, line in, microphone, serial, parallel, video-out, PS/2, USB, RJ-11, and Fast IR. Additional ports can be gained through the \$600 (street) PCGA-DB7 Network Dockstation, which adds 10Base-T Ethernet, SCSI-2, and digital video ports along with a battery charger. The only downside here is Sony's one-year parts-and-labor warranty.

On our benchmark tests, the PCG-707C performed well, beating the like-configured HiNote on our Winstone and Graphics WinMark measures. It ran for 1:42 on our BatteryMark test.

Targeting everyone from home users to multimedia professionals, the Sony PCG-707 is a complete multimedia package in a lightweight box.

Sony PCG-707. Street price: \$4,500. Sony Electronics, San Jose, CA; 800-476-6972, 941-768-7676; www.sony.com/pc. Circle 404 on reader service card.

The Ultimate Ultraportable

Never judge a package by its size. The incredibly compact Nimantics Persona T-120 is so light that you can tuck it under your arm, but it's also powerful enough to offer everything a road warrior dreams of.

The product of a joint venture between Nimantics and IBM (IBM Japan is producing the unit), the Persona T-120 is Nimantics' answer to the Toshiba Libretto—only in this case, you're not sacrificing a whole lot in exchange for the slim, featherweight size.

The epitome of a personal notebook, the Persona measures just 9.2 by 6.8 by 1.3 inches and weighs just 3.4 pounds with AC and two lithium battery packs. The \$2,399 unit features a 120-MHz Pentium processor, 24MB of EDO RAM, an 810MB hard disk, and a Chips & Technology 65550 graphics chip set with 1MB of EDO VRAM.

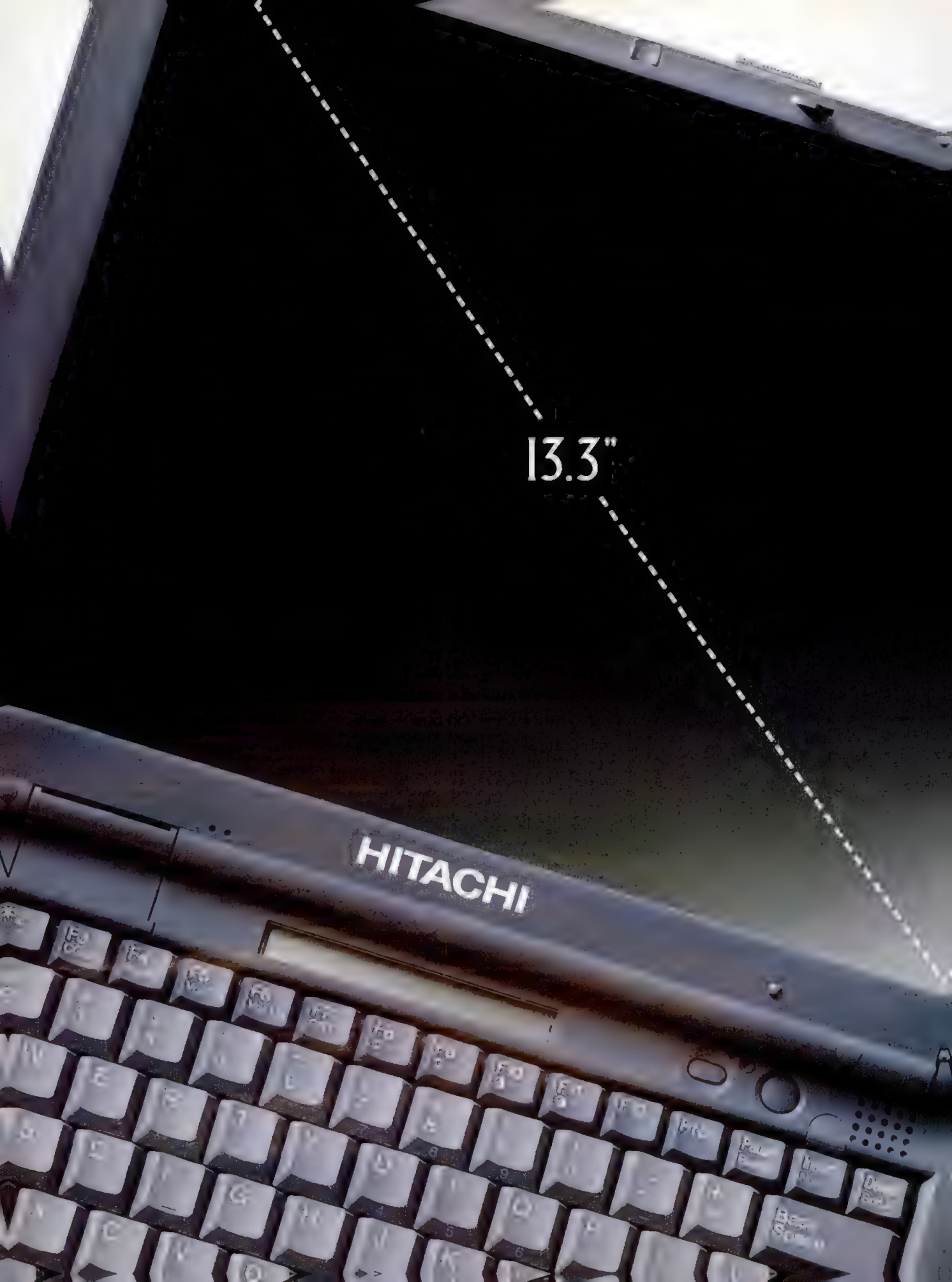
The system has three PC Card slots (one with Zoomed Video support), 16-bit stereo sound, integrated speakers, and a micro-

phone. System ports found at the rear are serial, parallel, Fast IR, and video-out; the external floppy port, as well as the headphone and microphone jacks, are covered by a rubberized strip at the front of the machine. Also, an 8X PC Card external CD-ROM module is a \$399 option.

With all of this computing power, the Persona's biggest tradeoff lies in its screen and keyboard size. The sharp 8.4-inch screen is downright cramped when compared with the other extreme (as seen in the Digital HiNote Ultra 2000, reviewed here). But

considering that it's larger than some notebook screens from just two years ago, this notebook screen is perfectly adequate for most tasks. The 86-key Windows 95 keyboard and integrated pointing stick is more comfortable than the Libretto's keyboard and screen-embedded pointing device. It's also smaller than the usual notebook keyboard—the key pitch is 15.1 mm, as opposed to the full-size pitch of 19 mm.—MJP





13.3"

HITACHI

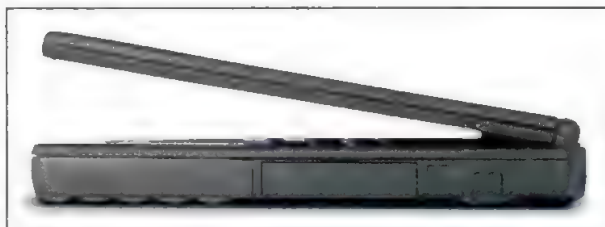
IT MAKES OTHER NOTEBOOKS FEEL INADEQUATE.

Not in their wildest dreams has anyone ever made a notebook like the new Hitachi VisionBook Elite™. At 13.3" – the largest in its class by 23% – it's the most breathtaking view ever offered on anything this thin, light, and powerful. And with its hyper-fast U.S. Robotics x2™ modem, and slim media filebase, the VisionBook Elite offers functionality and communications abilities unmatched by anyone. In short, the highest development to date of the Mobilized Computing™ concept. Drop by an Hitachi dealer and take in our panoramic vista. Because if you're thinking of getting anything else, you're not thinking big enough.



SIGNIFICANT FEATURES

- Extremely thin (1.4") and light.
- 512K L2 cache.
- Super large 13.3" TFT display (largest in its class), XGA resolution.
- 166MHz Intel Pentium® processor with MMX™ technology – fastest in a notebook.
- U.S. Robotics® 56K* x2™ modem – fastest in a notebook.
- Detachable filebase with 10x CD ROM and 3.5" floppy drive.
- 16MB EDO RAM, 2.1 GB hard drive.
- Extended life Lithium-Ion battery.
- Optional advanced port replicator.
- Full-size keyboard.



Call 1-800-HITACHI
www.HitachiPC.com

© 1997 Hitachi PC Corporation (USA). All rights reserved. Hitachi VisionBook Elite and Mobilized Computing are trademarks of Hitachi PC Corporation (USA), which may be registered in some jurisdictions. The Intel Inside logo & Pentium® are registered trademarks and MMX is a trademark of Intel Corporation. All other marks are owned by their respective companies. *All x2 products are capable of 56Kbps downloads; however, due to FCC regulations which restrict power output, current download speeds are limited to 53Kbps. Model shown is 8560 and specs quoted apply to that model. Specifications and availability subject to change without notice.CIRCLE 143 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLinkPCM 1021

First Looks

VOICE RECOGNITION SOFTWARE

Talking to Your PC

IBM's ViaVoice is great for dictation, but you can't use it to navigate Windows verbally. —By David Haskin

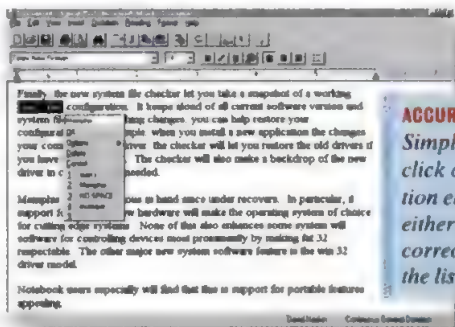
Continuous-speech dictation has quietly emerged as a practical way to add text to your applications. IBM's \$100 ViaVoice, the second continuous-speech product released in recent months, is a fast, accurate, and inexpensive way to speak normally to your PC instead of pausing clumsily between words. Nevertheless, it lacks some important features.

Unlike Dragon Systems' NaturallySpeaking (First Looks, September 23, 1997), you cannot use ViaVoice to navigate through Microsoft Windows 95 and your applications to correct dictation errors. But you can dictate into SpeakPad, ViaVoice's text editor, or into Microsoft Word; you instruct the installation program to add buttons to the Word toolbar for starting, stopping, and correcting dictation. By contrast, NaturallySpeaking works only with its proprietary text editor.

ViaVoice comes with a main dictionary containing generic acoustic information for about 22,000 common American English words. In addition, it has a secondary dictionary with about 200,000 words that it accesses if it can't find a word in the main dictionary. During initial training, you speak about 250 sentences into the included microphone. Then, ViaVoice analyzes your pronunciations and voice patterns and incorporates that acoustic information into the dictionary, which increases accuracy.

We found that ViaVoice performed quickly and accurately

immediately after we completed the enrollment process. The first time we tried it, we dictated 116 words per minute with only



eight errors, which is much faster than most people can type and slightly faster and more accurate than NaturallySpeaking's initial results. For the test, we read from printed text, which is the fastest way to dictate. Subsequent dictation resulted in slight speed increases and significant improvements in accuracy—within an hour, we experienced only four or five dictation errors during our minute-long tests.

When you correct errors, ViaVoice adds the new acoustic information to its dictio-

ADD WORDS: ViaVoice's Vocabulary Expander can analyze documents you've already created and add unfamiliar words to its dictionary.

nary so that similar errors are unlikely to occur in the future. To correct an error, you double-click on the mistake and a dialog box appears containing several sound-alike words. Then you either click on the correct word or type it in. Although we found this method easy for correcting documents after finish-

ing dictation, it was clumsy when we wanted to make corrections on the fly.

If you don't remember what you said, you can listen to a recording of your dictation. Besides speeding correction, the ability to listen to what you said makes ViaVoice an excellent, convenient tool for dictating documents edited by others.

ViaVoice includes advanced tools for increasing accuracy and adding words to the dictionary.

You can add new words by saying them and correcting them. You can also import existing documents created by applications such as your

word processor. ViaVoice analyzes the document and lists words that are not found in the product's dictionary; then you train those words. You can also create dictation macros that insert boilerplate text or specialized words when you issue a voice command.

To transfer dictated text from SpeakPad to other applications, you need only have the other program open and the cursor in the location where you want to insert the text. You then highlight the text you want to trans-

spreadsheet applications required some patience, since you must constantly move the cursor in the second application to the correct insertion point and then return to SpeakPad to transfer the text.

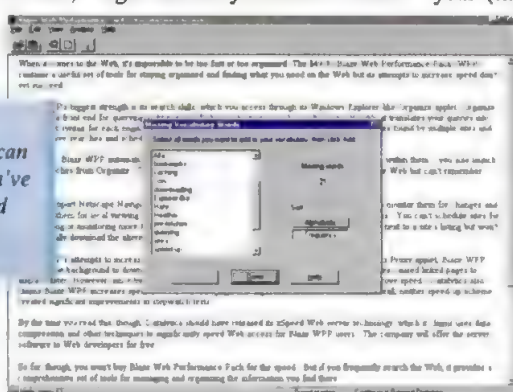
In addition to its lack of voice-activated navigation and error correction, ViaVoice suffered from a handful of other shortcomings. Its reliance on the keyboard and mouse make this product a poor choice for the physically challenged. It can convert text to speech even if you type it, which is often useful for the visually impaired. Still, the visually impaired would benefit from the ability to edit with voice commands—you can't do that with this program.

ViaVoice's microphone is overly sensitive to incidental noise. Dictation errors were guaranteed if we stroked our chin or breathed deeply during dictation. Also, ViaVoice has virtually no written documentation, except a cheat sheet for handling common dictation commands (such as how to speak numbers and punctuation) and a brief booklet in the CD-ROM's jewel case.

IBM promises that it will introduce ViaVoice Gold later this year (this product will include

navigation capabilities). But for now, those who do not like to type will find ViaVoice an inexpensive way to get into voice dictation. Nevertheless, it is not yet capable of true hands-off text dictation.

IBM ViaVoice. Street price: \$100. Requires: 166-MHz or faster Pentium CPU, 32MB RAM for Mi-



crosoft Windows 95 (48MB RAM for Microsoft Windows NT 4.0), Sound Blaster-compatible sound card. IBM Corp., Armonk, NY; 800-825-5263; www.software.ibm.com. Circle 408 on reader service card.

RISK FREE!

We thoroughly test each memory module and stand behind it 100%. That means a lifetime warranty (specific terms and limitations apply) and a 30-day, money-back guarantee on every order.

HASSLE FREE!

Never installed memory before? No problem. Our "It's A Snap" installation guide will have you up and running in just a few minutes. Plus, our technical engineers are ready with FREE support if you need it.

SHIPPED FREE!

Free second-day shipping means you'll receive your order in two days or less. (Orders outside the continental U.S. may take longer.)

16 MB MODULES AS LOW AS \$74.00

30-pin SIMM

1 MB	1x8	\$14
4 MB	4x8/9	\$37/\$43

72-pin SIMM

4 MB	1x32	\$25
8 MB	2x32/36	\$44/\$69
16 MB	4x32/36	\$74/\$80
32 MB	8x32/36	\$150/\$160

72-pin SODIMM

4 MB	1x32	\$33
8 MB	2x32	\$44
16 MB	4x32	\$77

144-pin SODIMM

8 MB	1x64	\$42
16 MB	2x64	\$75
32 MB	4x64	\$250

180-pin DIMM

8 MB	1x64	\$49
16 MB	2x64/72	\$77/\$94
32 MB	4x64/72	\$149/\$176
64 MB	8x64/72	\$300/\$344

Volume discounts available.

Why Not Buy Your Memory From The Same Place Your Computer Manufacturer Did?

Call Us Direct.

When your computer has a name like Compaq®, Dell®, Hewlett Packard®, or Gateway® you expect a certain level of quality. That's why the top PC manufacturers in the world have installed over 30 million megabytes of Micron RAM. They know they are installing memory they can trust. And now you can too.

Crucial Technology is a division of Micron, one of the largest RAM manufacturers in the world. When you buy Micron memory from Crucial, you are buying the highest quality memory from the most reliable source.

Remember, not all RAM is created equal. Don't trust your computer with anything less than the best.

Memory Is Crucial.™



Order anytime, anywhere at
www.micron.com/crucial
Or call us at 1-800-932-4993
M-F 7am - 7pm, Sat 8am-3pm, MST

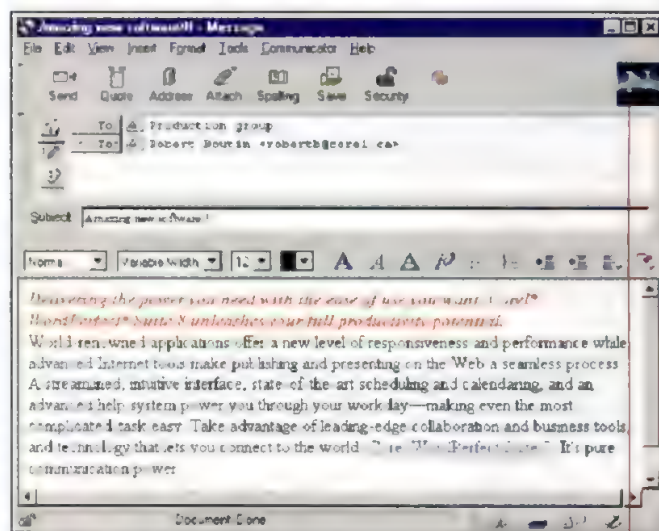
crucial
TECHNOLOGY
Micron Memory Direct

Corel® WordPerfect® Suite 8

Fully Integrated Web

Communication Features	Corel® CENTRAL™ 8	Microsoft® Outlook 97
Create a "Planner" containing a calendar and multiple card files	✓	no
Publish to HTML	✓	no
Add freeform notes to calendar	✓	no
Easily add custom fields to address book	✓	no
Schedule group events over the Internet	✓	no
Assign To Do items over the Internet	✓	no
Easily follow e-mail threads	✓	no
Compose content-rich HTML messages for assigned To Do items	✓	no
Type personal To Do items directly in list	✓	no
Built-in conferencing	✓	no
Built-in HTML page composer	✓	no
Access Internet newsgroups and corporate discussion groups using mailbox interface	✓	no
Conduct and save a "live" chat session	✓	no
Organize cards into groups	✓	no
Participate in collaborative Internet browsing	✓	no
Support for LDAP	✓	no
Surf the Internet using an integrated browser	✓	no
Create simple, flexible card files	✓	no
Link cards to documents or applications	✓	no

Corel® WordPerfect® Suite 8 delivers the best features to stay on top—in business, at home, wherever you want to make an impact. All-new applications like **CorelCENTRAL™ 8** with fully integrated **Netscape® Communicator**—available in *both* the standard and professional versions—maximize your communication, organization and teamwork capabilities. Corel WordPerfect Suite 8—office suite technology that takes you further.



Mailbox – send and receive e-mail messages using open Internet standards

To buy Corel WordPerfect Suite 8, contact your local reseller.



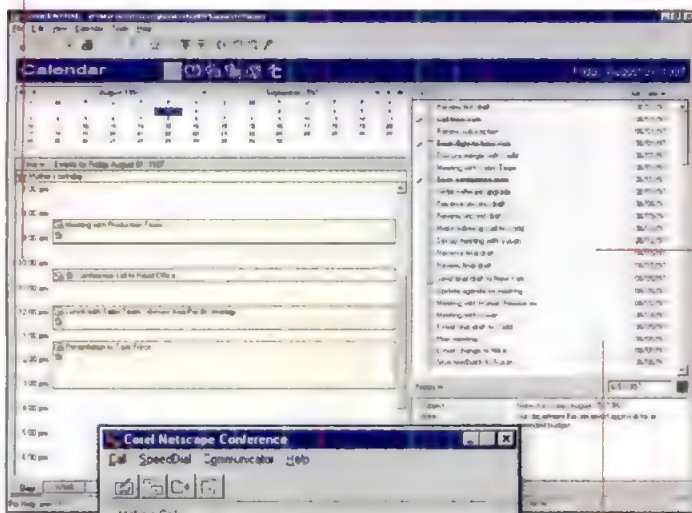
OfficeMax®
Taking Your Savings To The Max!
1-800-788-8080

*For upgrade version only. US\$ plus applicable taxes and shipping. Dealer may sell for less. Prices may vary from store to store.

+ Netscape® Communicator & Desktop Power

Calendar and Scheduling – organize and keep track of your schedule and tasks, and create personal and workgroup tasks

Flexible Card Files – store a wide variety of information including contacts and inventory. Ultra-powerful linking technology lets you connect card file records, other files, even Internet addresses



Multiple View – view data from different perspectives using a simple, browser-like interface

Conferencing – share information and have real-time voice conversations using your Internet connection



N Includes
Netscape
Communicator

**Two great office suites.
Outstanding communication
technology.**

Office Suite Excellence

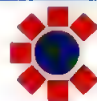
†Internet connection required for many of the features included in CorelCENTRAL 8

Copyright © 1997 Corel Corporation. All rights reserved. Corel, WordPerfect and CorelCENTRAL are trademarks or registered trademarks of Corel Corporation or Corel Corporation Limited. Microsoft and Windows are registered trademarks of Microsoft Corporation. Netscape is a registered trademark of Netscape Communications Corporation. The MMX logo is a trademark of Intel Corporation. All other product, font and company names and logos are trademarks or registered trademarks of their respective companies.

CIRCLE 011 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



Corel, Official World Title Sponsor
of the COREL WTA TOUR



CorelWORLD
COMMUNICATIONS
AND SUPPORT



www.corel.com
Call now for faxed literature!
1-613-728-0826 ext. 3080
Document # 1383

KUR-0455-US

First Looks

LCD PROJECTORS

Portability Without Compromise

Epson's new 1,024-by-768 PowerLite 7000 is not only a small, lightweight LCD projector, but it produces a great image to boot.—By M. David Stone

Few LCD projectors have a legitimate claim on portability, and even fewer—as yet—offer a native 1,024-by-768 resolution. That puts the Epson PowerLite 7000 in rare company on two counts. The combination partly accounts for the unit's premium list price of \$12,999. Nevertheless, it does not sacrifice video quality.

The PowerLite 7000 scores well on all three measures of portability: It is lightweight at 14.5 pounds, it is small at 6.3 by 9.7 by 15 inches (HWD), and it has a choice of different cases, including two that will help the unit survive as you're rushing through an airport.

Once you finally get where you're going, you won't have to apologize to anyone about poor image quality. The PowerLite 7000 is rated at 400 lumens, which is bright enough so that a 70-inch diagonal image is easily readable in a fully lit room, even if you have to project it on a wall instead of on a screen. Epson claims that the projector is suitable for 23- to 300-inch diagonal images. The 150-watt metal halide bulb is rated for about 2,000 hours, which Epson calculates will last you about five years.

The projector has separate LCDs for red, green, and blue. This adds to the price; a sophisticated optical system must combine the three colors into one image with unerring precision. But it also promises better 24-bit color than a single LCD. As is standard for a three-panel design, the projector uses polysilicon active-matrix (TFT) LCDs. These allow smaller panels (1.3 inches) than the more common

amorphous silicon LCDs. This in turn helps keep the projector down to a reasonable size.

The LCDs offer 1,024-by-768 resolution. Nonetheless, the unit can also accept VGA, SVGA, 1,280-by-1,024, and Macintosh res-

noticeable raggedness.

On our tests with Sonera's DisplayMate, the PowerLite 7000 showed only a few minor problems. The unit had a slight misregistration between green on the one hand and both red



PORTABLE PROJECTION: The PowerLite 7000 projects images with superb quality.

olutions such as 832-by-624. For resolutions below 1,024-by-768, the PowerLite 7000 can add extra pixels to take full advantage of the LCD. Or it can show the image in the lower resolution, leaving a frame of unused LCD cells around the image. With resolutions above the native resolution, it can show as much as will fit onto the screen and scroll to show the rest. It can also show the whole image at once, dropping pixels in order to fit the image.

Adding or dropping pixels is something that's easy to do badly. Still, the PowerLite 7000 does it well, using sophisticated algorithms to minimize image degradation. At lower resolutions, text remains well formed. Some artifacts did show up as repeating patterns on some test screens, but that's unavoidable. At 1,280-by-1,024 resolution, the text showed

and blue on the other. It also showed slight streaking, or ghosting, on a screen designed to bring out streaking. Neither problem was bad enough to prove annoying, though, and there were no other problems worth mentioning.

On our sound tests, the 2-watt-per-channel Spatializer 3D Sound System proved adequate for a small- to medium-size conference room. Volume is minimal. Sound quality is too good to describe as tinny, but it isn't overly impressive. If sound matters for your presentations, you'll probably want to carry some external amplified speakers to plug into the audio output.

Setup is reasonably standard for an LCD projector. You'll find connectors for video, audio, and mouse connections to both a primary and secondary computer. An S-Video DIN connector and composite video and audio con-

nectors let you plug in a VCR or other video source in NTSC, PAL, or SECAM format. The audio output uses a stereo mini-jack connector.

The projector comes with an assortment of cables, including everything you'll need to make connections—video, audio, and mouse—to either a PC or a Mac. It also includes an RCA phono plug cable for composite video and audio. For \$174, you can get a set of cables from Epson for a second computer.

The mouse cable can plug into either a PS/2 or serial mouse port on your system, and it can plug into a separate serial port as well. The serial port will let you control projector settings through software that comes with the unit. If you prefer to use the control panel on top of the unit or the infrared remote, you'll find that the on-screen menus are straightforward. Still, you'll probably have to read the manual to use some of the niftier features, such as the zoom control.

One other feature worth mentioning is Private Line, Epson's prepaid phone card. Dial an 800 number and a seven-digit PIN on the card and you'll go directly to technical support, skipping the usual queue. The phone card has a finite number of prepaid calls, but you can add to it at no charge with a call to customer support.

This extra level of support comes partly from Epson's recognition of the special needs of someone who may run into a time-critical problem while trying to give a presentation and partly from an acknowledgment that this is a big-ticket item that deserves special support. Whatever the logic behind it, the support policy is every bit the class act of the projector itself.

PowerLite 7000. List price: \$12,999. Requires: Monitor output connector on PC or S-Video or composite video connector. Epson America Inc., Torrance, CA; 800-463-7766; 310-782-0770; www.epson.com. Circle 405 on reader service card.



DISCOVER WHY WHIRLPOOL CHOSE THE WORLD'S MOST PRODUCTIVE DIAGRAMMING TOOL.



"FlowCharter helped me quickly create a model for our new centralized operation."
—Randy Zimmerman
Process Manager

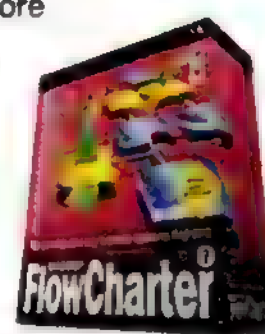
TAKE NEW FLOWCHARTER™ 7 FOR A FREE SPIN AT WWW.MICROGRAFX.COM/SPIN

Centralizing 26 service operations into 1 would send most executive's heads spinning. Not at Whirlpool® Corporation. With Micrografx FlowCharter, Whirlpool® Corporation developed a consolidation process that resulted in increased efficiency and productivity.

Whirlpool® Corporation is one of many organizations, both large and small, that use FlowCharter. In fact, 60 of the Fortune 100 corporations have found it to be the easiest, quickest and most productive diagramming tool for their business processes.

FlowCharter isn't just another diagramming tool. You can diagram any process across any number of pages, with intelligent lines that automatically re-route and shapes that quickly drop into place.

New FlowCharter 7 offers more powerful tools than the previous version — ABC FlowCharter. It includes revolutionary Living FlowCharts™ that turn static diagrams into dynamic interactive processes and CoolSheet™ Templates that jump start the most common diagrams.



FlowCharter 7 is also available in Graphics Suite, the only enterprise-wide graphics solution for today's corporation.

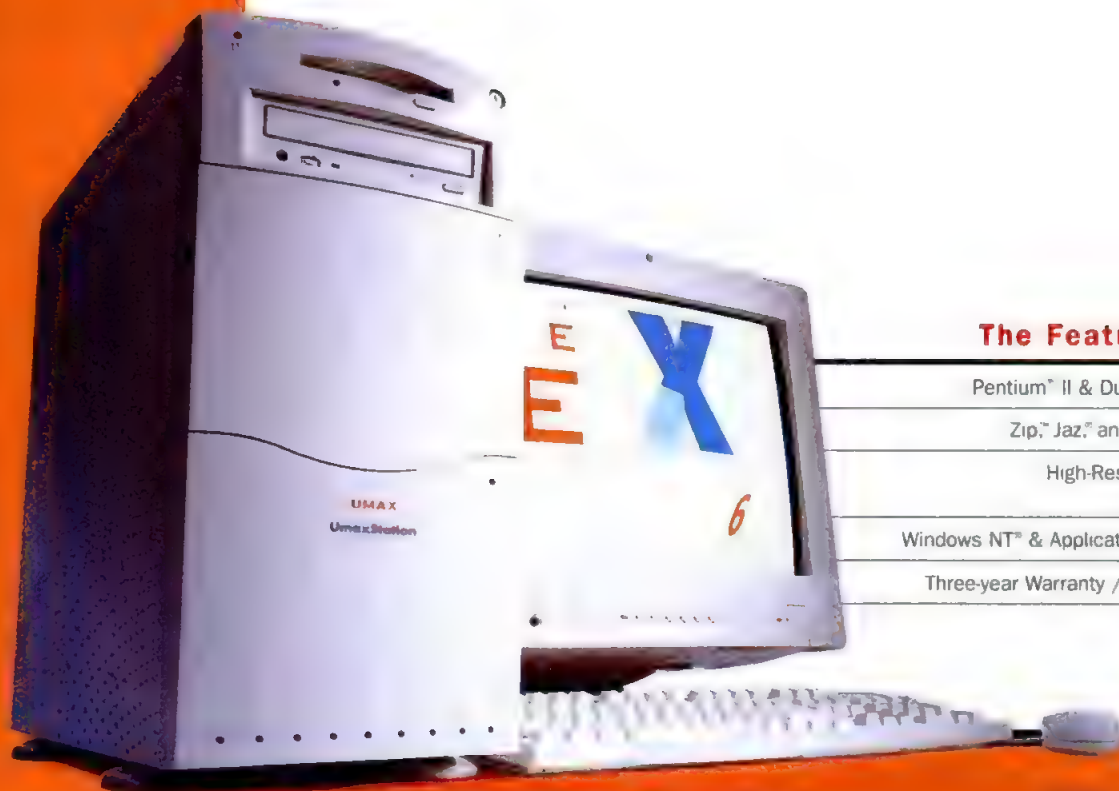
In short, Micrografx FlowCharter bolsters productivity, refines processes, streamlines quality initiatives, helps you attain ISO-9000 certification, and makes your business run smoother. Request a FREE full-working 30 Day Trial of FlowCharter 7 at www.micrografx.com/spin or call us at 1-888-643-0132.



MICROGRAFX®

Canada call 800-360-8464. For license pricing on Micrografx FlowCharter, please contact Micrografx directly or call your preferred corporate reseller. ©1997 Micrografx Inc. All rights reserved. All trademarks are owned by their respective companies.

Picture The Possibilities



The Features You Need:

Pentium® II & Dual Pentium II Processors

Zip,™ Jaz,™ and DVD Multimedia Drives

High-Resolution Display Adapters
& Flat Square Monitors

Windows NT® & Application Software from Adobe

Three-year Warranty / One-year Onsite Service

UMAX—GRAP

NT SYSTEMS DESIGNED FOR

UmaxStation 6010

- Intel 233MHz Pentium II processor
- 32MB EDO RAM/512KB Pipeline Burst Cache
- 4GB EIDE Hard Disk Drive
- 24X CD-ROM Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- Matrox Millenium 4MB WRAM Graphics Card
- 17" Flat Square Color Monitor (15.9" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows® 95 available)
- Adobe® PhotoDeluxe™, Adobe PageMill™ 2.0, Adobe Type Manager®, Lotus SmartSuite®

#S6010.....\$2495

Business leases starting at \$60/month

UmaxStation 6210

- Intel 266MHz Pentium II processor
- 128MB EDO RAM/512KB Pipeline Burst Cache
- 5GB EIDE Hard Disk Drive
- 24X CD-ROM Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- Matrox Millenium 8MB WRAM Graphics Card
- 17" Flat Square Color Monitor (15.9" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers with Sub-Woofer
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PhotoDeluxe, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#S6210.....\$3795

Business leases starting at \$92/month

UmaxStation 6410

- Intel 300MHz Pentium II processor
- 128MB EDO RAM/512KB Pipeline Burst Cache
- Adaptec® 2940 Ultra-Wide SCSI-3 Controller
- 4GB Ultra-Wide SCSI Hard Disk Drive
- 24X CD-ROM Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- ELSA Gloria-L 8MB VRAM/BMB DRAM 3D Graphics Accelerator
- 19" Dynamic Focus Color Monitor (18" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers with Sub-Woofer
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PhotoDeluxe, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#S6410.....\$5495

Business leases starting at \$133/month

Toll Free: 1-888-289-8629 Keycode #203

1-888-BUY-UMAX

www.umaxpc.com

GET CREATIVE

UMAX®

NT Systems for Creative Professionals

Umax understands that creative work requires a special kind of system. That's why we've drawn upon 10 years' experience to develop a new line of NT-based, Adobe-driven workstations that give designers, animators, illustrators, and production artists everything they need. The high-end **UmaxStation** models feature state-of-the-art dual Pentium II 266Mhz processors for maximum power and come bundled with Adobe's latest graphics applications. The **UmaxPC** line of value-priced systems includes many of the same graphics-ready components— Zip drives, high-end video cards, 56K modems— at very affordable prices. Whatever your plans, whatever your budget, we've got a graphics system that will inspire your creativity. These are the machines you need, from a company that knows how to build them.

HICS POWER

CREATIVE PROFESSIONALS.

UmaxStation 9010

- Dual Intel 266MHz Pentium II processors
- 64MB EDO RAM/512KB Pipeline Burst Cache
- Adaptec 2940 Ultra-Wide SCSI-3 Controller
- 4GB Ultra-Wide SCSI Hard Disk Drive
- 24X CD-ROM Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- Matrox Millenium 4MB WRAM Graphics Card
- 17" Flat Square Color Monitor (15.9" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers with Sub-Woofer
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PageMaker® 6.5, Adobe Photoshop® 4.0, Adobe Illustrator® 7.0, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#S9010.....\$4995

Business leases starting at \$122/month

UmaxStation 9310

- Dual Intel 300MHz Pentium II processors
- 128MB EDO RAM/512KB Pipeline Burst Cache
- Adaptec 2940 Ultra-Wide SCSI-3 Controller
- 9GB SCSI Hard Disk Drive
- 24X CD-ROM Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- Matrox Millenium 8MB WRAM Graphics Card
- 21" DiamondTron Color Monitor (19.7" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers with Sub-Woofer
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PageMaker 6.5, Adobe Photoshop 4.0, Adobe Illustrator 7.0, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#S9310.....\$7995

Business leases starting at \$194/month



Turn the page to
find out more
about affordable
UmaxPC systems.

1-888-BUY-UMAX

Call Free 1-888-270-8800. Payable #200

GET CREATIVE

UMAX®



UMAXPC.

AFFORDABLE NT GRAPHICS SYSTEMS FOR CREATIVES.

UmaxPC 2010

- Intel 200MHz Pentium processor with MMX™ technology
- 32MB EDO RAM/512KB Pipeline Burst Cache
- 3GB Ultra DMA Hard Disk Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- 24X CD-ROM Drive
- ATI 3D XPression 4MB EDO Graphics Card
- 15" Flat Square Color Monitor (13.7" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PhotoDeluxe, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#P2010.....\$1795

Business leases starting at \$43/month

UmaxPC 2210

- Intel 200MHz Pentium processor with MMX
- 32MB EDO RAM/512KB Pipeline Burst Cache
- 4GB Ultra DMA Hard Disk Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- 24X CD-ROM Drive
- Matrox Millennium 4MB WRAM Graphics Card
- 17" Flat Square Color Monitor (15.9" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PhotoDeluxe, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#P2210.....\$2195

Business leases starting at \$53/month

UmaxPC 2410

- Intel 233MHz Pentium processor with MMX
- 64MB EDO RAM/512KB Pipeline Burst Cache
- 5GB Ultra DMA Hard Disk Drive
- 100MB Zip Drive, 3.5" Floppy Drive
- DVD Multimedia/CD-ROM Drive
- ATI 3D XPression 4MB EDO Graphics Card
- 19" Multi-Step Dynamic Focus Color Monitor (18" v.a.)
- 56Kbps Data & Fax Modem
- 10/100TX PCI Ethernet Card
- Creative Labs 3D Sound, Audio In/Out & Mic ports
- Amplified Stereo Speakers with Sub-Woofer
- Mid-tower Case with 250W Power Supply
- EPP/ECP printer port, (2) 16550 serial ports, (2) USB ports
- PS/2 Keyboard & Microsoft IntelliMouse
- Windows NT Workstation (Windows 95 available)
- Adobe PhotoDeluxe, Adobe PageMill 2.0, Adobe Type Manager, Lotus SmartSuite

#P2410.....\$3295

Business leases starting at \$80/month

Options for UmaxStation and UmaxPC systems:

- 15" Flat Square Color Monitor (13.7" v.a.)**\$285**
- 17" Flat Square Color Monitor (15.9" v.a.)**\$485**
- 19" Dynamic Focus Color Monitor (18" v.a.)**\$985**
- 21" DiamondTron Color Monitor (19.7" v.a.)**\$1345**
- 4x/6x Yamaha Recordable CD-ROM**\$675**
- Iomega® Jaz Drive**\$345**
- Adobe Premiere® 4.0**\$495**
- Adobe After Effects®**\$645**
- Iomega Ditto™ 3200 Tape Drive**\$195**
- Adaptec 2940UW SCSI Controller**\$185**
- Yamaha Stereo Speakers with Sub-Woofer**\$115**
- Three-Year Onsite Extended Warranty**\$125**

Ordering

To order, call 1-888-BUY-UMAX between 6 am and 6 pm Monday-Friday, and 9 am and 6 pm Saturday-Sunday (Pacific time). To configure your system online, visit our web site at www.umaxpc.com. We welcome payment by Visa, MasterCard, Discover, American Express, wire transfer, money order, or check. Check orders are held 5-10 days for clearing. Purchase Orders from major corporations, government offices, and educational institutions are gladly accepted.

Warranty

All UmaxPC and UmaxStation systems are backed by the Umax 30-day Moneyback Satisfaction Guarantee and are covered by a three-year limited warranty with one year of onsite service. For a complete copy of our guarantees, limited warranties, or service policies, please write to Umax Systems Sales, 3485 Kifer Road, Santa Clara, CA 95051, or visit our web site at www.umaxpc.com.

Shipping

Umax offers a variety of shipping services, ranging from UPS Groundtrack to Federal Express Priority Overnight. Please ask your salesperson for details regarding pricing and availability.

Technical Support

Technical support for UmaxPC and UmaxStation systems is available 24 hours a day, seven days a week. Additional technical support is provided by the publishers of software bundled with Umax systems. Complete information on technical support is included with each system.

Umax Technologies, Inc. is not responsible for omissions or errors in typography or photography. Prices and specifications valid in the U.S. only and subject to change without notice. All purchases are subject to availability, and are subject to Umax Technologies' current terms and conditions of sale. Prices do not include shipping and handling. 30-day money back guarantee policy does not include return freight and original shipping/handling charges, applies only to UmaxPC brand products, and begins on the date of shipment. Onsite service is provided by an independent third-party provider and may not be available in certain remote locations. The Intel Inside logo and Pentium are registered trademarks, and MMX is a trademark of Intel Corporation. MS, Microsoft, Windows, and Windows NT are registered trademarks of Microsoft Corporation. All other trademarks or registered trademarks are property of their respective companies. © 1997 Umax Technologies, Inc. All rights reserved.



Toll Free: 1-888-289-8629 Keycode #203

1-888-BUY-UMAX

CIRCLE 242 ON READER SERVICE CARD

www.umaxpc.com

Umax Systems Sales
3485 Kifer Road, Santa Clara, CA 95051 0711
408 617-0270 • Fax 408-735 0222

First Looks

INTERNET TELEPHONY

Talking on the Net

VocalTec's Internet Phone lets you talk long distance without Ma Bell.—By Karen J. Bannan

VocalTec Communications may just break down the barriers that have kept Internet telephony from becoming a mainstream application with Version 5.0.103 of its Internet Phone product.

Internet Phone has many fun and functional new features designed to help users connect with new people while making it easier to connect with those they already know. Most notably, Internet Phone has added the Community Browser, which serves as a meeting point for users (taking the place of its Global On-line Directory) as well as computer-to-phone access, so you can call people using only your PC.

The Community Browser's interface resembles that of an online service's chat room. There are two kinds of chat rooms available: "public" and "member." The rooms are divided into ten categories (General, Culture, Leisure, International, Computers, Music, Business, Romance, and Games and Kids) and a multitude of subcategories.

These rooms serve two purposes. First, you can use them to call individuals directly by either clicking on their names or using the right-click menu. Once you've called a person, you'll be able to voice-chat or text-chat with them. And second, while you're in the chat rooms you'll be able to speak to an entire group of people using text-chat (as long as the chat has been set up that way beforehand).

While we were testing this product, there were always more than 100 different rooms available in each category at any given time. The best part is

that you can be connected with multiple rooms simultaneously and keep track of them using the scrolling box at the bottom of the product's interface.

Internet Phone's PC-to-phone functionality will probably have the most far-reaching

cal user interface, which made it very easy to call our friends. We were disappointed, however, that we still had to pay long-distance fees.

Everyone using the PC-to-phone capabilities must first sign up with an Internet telephony service provider (ITSP). There are costs associated with this, but an ITSP's fees are significantly lower than what you'd have to pay to a normal long-distance carrier. Nevertheless, if you like to talk these costs pack quite a punch.

Instead of choosing an ITSP in your local area, you'll have to pick one that services the area you'd like to call. This means that you may end up with several of them if you have friends scattered all over the world. Once you have signed up with an ITSP, you can select the corresponding entry from the pull-down menu under the number pad and enter the number you want to call into the small dialog box above it.

Finally, you can still use the program to make free computer-to-computer calls directly, as long as there's a listing for the computer you want to call in the

bandwidth-eater. If you have a small pipe coming in from the Internet, you'll probably want to limit your video connections.

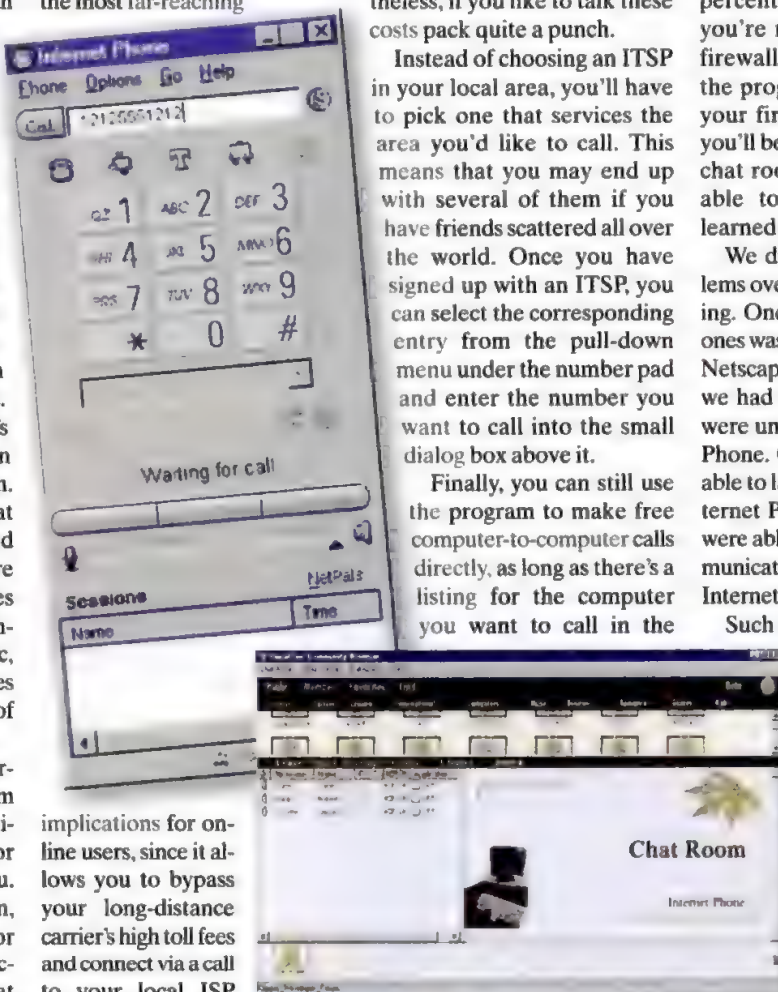
If you are behind a firewall there is unfortunately a 60 percent chance you won't be able to use the program to talk to people in chat rooms or outside of your organization, since firewall support is spotty at best. Internet Phone supports only CheckPoint firewalls, which are installed in about 40 percent of U.S. businesses. If you're not sure what kind of firewall you have, download the program and try it out. If your firewall isn't supported, you'll be able to see people and chat rooms, but you won't be able to connect, a fact we learned the hard way.

We did notice several problems over the course of our testing. One of the most annoying ones was an incompatibility with Netscape Navigator 3.0. When we had Navigator running, we were unable to launch Internet Phone. Conversely, we weren't able to launch the browser if Internet Phone was running. We were able to run Netscape Communicator 4.0 concurrently with Internet Phone, however.

Such minor issues aside, Internet Phone is a fun, inexpensive way to talk to your friends over the Internet—whether they own a PC or not.

Internet Phone Release 5.0.103. List price: \$49.95 (\$19.95 for licensed users of Version 4; free download for a two-week trial period). Requires: Microsoft Windows 95 or NT, Pentium/75 or faster CPU, SLIP or PPP

connection, microphone, and speakers. VocalTec Communications Ltd., Northvale, NJ; 800-843-2289; fax, 201-768-8893; www.vocaltec.com. Circle 401 on reader service card



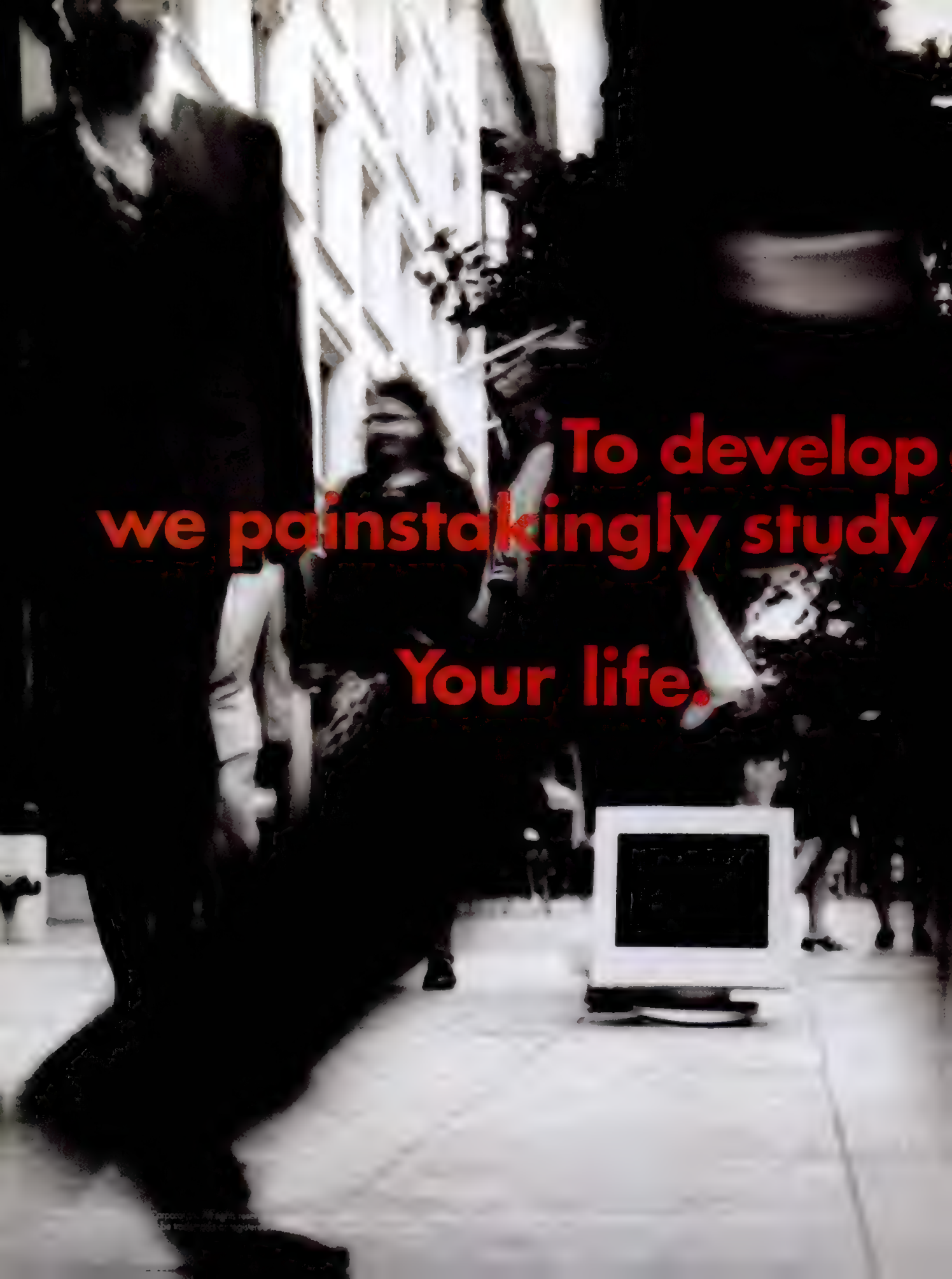
PHONE COMMUNITY: VocalTec has added the Community Browser (above) to Version 5.0 of Internet Phone, which also lets you keep a history of your chat sessions.

implications for on-line users, since it allows you to bypass your long-distance carrier's high toll fees and connect via a call to your local ISP at a minimal cost. Though this idea has been much touted in recent months, most

of the other programs that let you do this have flaws in their design or are difficult to work with.

We were impressed with VocalTec's Telephony Gateway technology and its graphi-

phone directory or you know the IP address. If you have a small "golf ball" camera, you'll also be able to videoconference with your friends, although this feature, like voice chat, is a big

A black and white photograph of a busy city street. In the foreground, a computer monitor sits on the ground. In the background, several people are walking, including a man in a suit on the left and a woman in the center. The text "To develop we painstakingly study Your life." is overlaid in red.

**To develop
we painstakingly study
Your life.**

While creating monitors requires a certain proficiency in the sciences, it also helps to know a few things about people. Like that some can effectively manage large MIS departments while fighting an addiction to the ESPN SportsZone web site. Or that others have dinner with a computer more often than with a significant other. Our philosophy of innovation is based on how all of us work, how we live. It's the force behind every monitor we make.

monitors this advanced, a very complex system.

The P110, the first 21" (19.8" viewable) Trinitron® monitor in existence, is designed for artistic souls whose ideas are simply too big for a smaller screen. The TFT500 flat panel is extraordinary in its ability to fit neatly into conference rooms like a corner office rampant with paper piles and golf equipment. The P50 and V70 offer the performance and value you'd expect from the best-selling brand of monitors on earth. They also offer the highest refresh rates in their class. A computer investment for those of us who associate a mere 40-hour work week with part-time employment.

More and more the world is being seen through a monitor. We invite you to see it all at www.compaq.com.



COMPAQ

First Looks

DIGITAL CAMERAS

CMOS Twins Arrive

Vivitar and UMAX bring the first CMOS cameras to market.—By Daniel Grotta and Sally Wiener Grotta

The \$499 Vivitar ViviCam 3000 and \$449 UMAX MDX-8000 (list prices) are OEM versions of SoundVision's SVmini, the first CMOS-based digital camera to hit the retail channel. Except for the name, plastic trim, price, and software bundle, these cameras are identical. Both have impressive specs, especially for sub-\$500 devices: 1,000-by-800 resolution, 30-bit color, 17-mm f4 fixed-focus glass lenses, live video mode, built-in strobes, sound annotation, and both internal memory and removable PC Card memory capabilities.

These devices fail to overcome some of the engineering idiosyncrasies found in CMOS technology. This translates into slower performance. In addition, each unit's image quality does not match that of lower-resolution, comparably priced CCD-based units.

The cameras look like fat point-and-shoot devices, with clamshell covers that double as lens protectors and on/off switches. Both have oversized grips that accommodate six AA batteries each. Sound Vision claims that users can shoot 200 to 300 images per set of batteries, depending on whether they use the flash.

There are only three buttons on each unit (shutter release, feature, and change/delete) and a six-digit alphanumeric control panel on top. The feature button and change/delete button toggle between image quality (best/standard), sound on/off, strobe on/off, and a 12-second self-timer. The delete button erases the last frame

when confirmed by pressing the shutter.

When tethered to a PC, other user-definable parameters—manual shutter speed (one-half to 1/2,000 of a second), resolution (1,000-by-800 or 500-by-400), and compression level (standard to high quality)—can be set and shot.

Because CCD-based digital

SHUT ER (shutter error) message. To be reinitialized, they must be pointed toward the sun or any bright light source.

To save the images, the Vivitar/UMAX uses Wavelet—rather than JPEG—compression, which allows the user to set the raw image file size between 10K and 100K (in 1K increments). The default is 40K, roughly midway between optimum quality and practical file size. At full resolution, decompressed file size is about 2.2MB, twice that of a typical 640-by-480 CCD camera.

Still, only 500K is available

One potentially useful feature, especially for Web publishers, is the Live Picture mode. There are four settings: high quality, standard quality, black and white, or color. The camera can run at 6 fps at 1,000-by-800 resolution or at 60 fps at 800-by-100 resolution, but their serial-port connections limit them to between 2.5 and 5 seconds per frame.

Despite the technology, the image quality is not what one would expect from a 30-bit, 1,000-by-800-pixel file. Though they weren't crisp, our test images were nonetheless well-focused. Unfortunately, we still see a number of problem areas, such as moires, aliased type, pronounced edge sharpening, and subdued colors. We had expected the cameras to shoot identically, and we were surprised when the UMAX underexposed 1.5 stops, exhibited high contrast, and shifted away from the midtones. Sound Vision explained to us that the

Vivitar unit has newer firmware (which you can download from either vendor's Web site) that flattened high-contrast scenes.

CMOS camera technology is still in its basic infancy. As a result, the Vivitar and UMAX cameras are not ready to compete against the more mature CCD-technology cameras.

ViviCam 3000 Digital Camera. List price: \$499. Requires: 486 PC or better, 8MB RAM, Windows 95. Vivitar Corp., Newbury Park, CA; 800-682-6677, 805-498-7008, www.vivitarcorp.com. Circle 406 on reader service card.

MDX-8000 Digital Camera. List price: \$449. Requires: 486 PC or better, 8MB RAM, Windows 95. UMAX Technologies Inc., Fremont, CA, 94538. 800-562-0311, 510-651-4000; www.umax.com. Circle 407 on reader service card.



TWO OF A KIND: The UMAX MDX-8000 and Vivitar's ViviCam 3000 have identical accompanying user interfaces.

cameras don't have to deal with dark current, it takes an average of 4 to 7 seconds to process and save an image. These CMOS cameras take about 28 seconds to process a shot before you can shoot another. This disqualifies them for applications like action photography, children's portraits, or other situations that require a number of shots to be taken in a relatively short period of time. Media Vision promises that new firmware will improve the processing time to about 20 seconds.

Having both a mechanical and an electronic shutter occasionally confuses the cameras, in which case the user will see a

for image storage. A 2MB PC Card memory card (included with the UMAX and optional with the Vivitar) is proprietary and cannot be read in any laptop or ATA-type PC Card drive. To acquire images, each camera must be attached to a PC's serial port. To compound the problem, removing cards from the cameras requires considerable strength, since both have no eject buttons.

The software is very simple, and the only preacquisition tools available are rotate and white balance correction. The cameras are not Twain compliant, but you are capable of batch-processing and saving in native, TIFF, or .BMP formats.

Breathtaking 233 MHz Speed At A Breathe Easy Price.

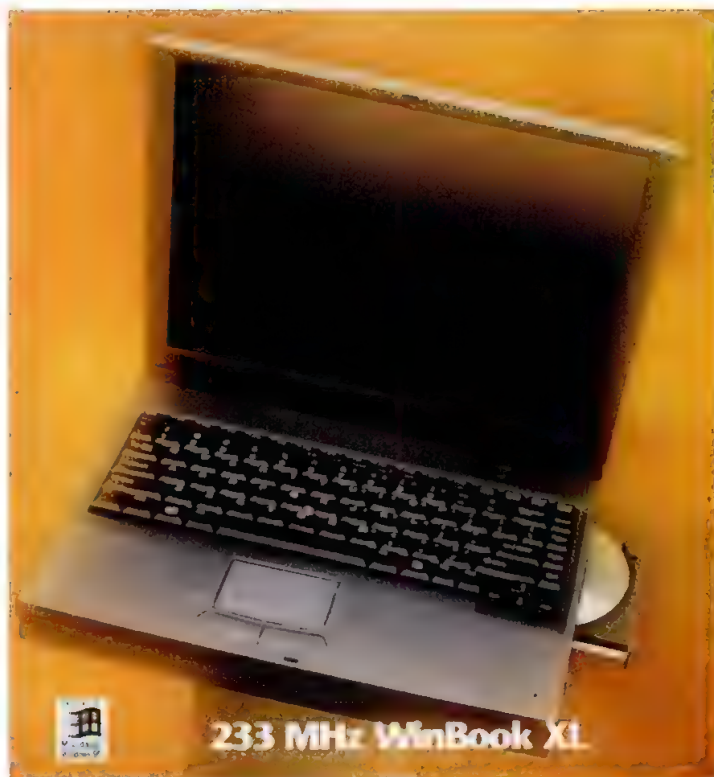
233 MHz is here!



Imagine a notebook computer that's loaded with features, is 40% faster than a 166 MHz notebook yet costs less than \$3600 and you've pretty much described our next award-winning design- the WinBook XL.

The XL is one of the fastest notebooks you can buy. It features the 233 MHz Intel® Pentium® Processor with MMX Technology, a 12.1" Active Matrix display (13.3 optional), 32 MB of EDO DRAM, a 3 GB HD, a 20x variable CD ROM and a 3.5" Floppy Drive that are available at the same time- no more swapping drives.

Only WinBook could offer this powerful notebook at an incredible \$3599. Order the XL today and see why WinBook has won more than 125 industry awards for quality, innovation and value.



233 MHz WinBook XL



FX
WinList
Oct '97



FX
Best Buy
Oct '97



FX
Honorable Mention
Aug '97



FX
Best Buy
Aug '97

WinBook FX-166 MHz Intel® Pentium® Processor with MMX® Technology, Running at 2.5V

- 12.1" SVGA TFT Active Matrix Color Display
- 32MB EDO DRAM, expandable to 72MB
- 256K Synchurst L2 cache
- 2.16GB Removable Hard Drive
- 33.6 Internal Fax/Data Modem
- PCI Graphics Accelerator w/1MB Video DRAM
- 16-bit Stereo Audio
- 59-Watt Lithium Ion Battery
- Option bay accepts Floppy drive or CD-ROM (both included) or 2nd Battery (optional)
- One Type II/III and one Type II PCMCIA Slot
- Integrated dual-button pointing stick with optional touchpad available
- Single infrared port, IrDA 1.0 compliant
- Parallel, Serial, PS/2, VGA, and Game port
- 7.25 lbs. with battery
- Windows 95® installed

Add \$199 for an optional 2nd battery or \$259 for a Mini-Dock w/AC adapter

\$2999

WinBook XL- 233 MHz Intel® Pentium® Processor with MMX® Technology, Running at 1.8V

- 12.1" SVGA Active Matrix Screen (add \$400 for 13.3" display)
- 32MB EDO DRAM, expandable to 128MB
- 3 GB removable Hard Drive
- 45Wh Lithium Ion Smart Battery
- 256K Synchurst L2 Cache
- 3.5" Floppy Drive and 20x variable speed CD-ROM both built-in
- Integrated dual-button pointing stick and touchpad, both active simultaneously
- 16-Bit Stereo Audio
- Two Type II or one Type III PCMCIA Slot, CardBus and ZoomVideo supported
- PCI Graphics Accelerator w/2 MB DRAM
- Parallel, Serial, PS/2, VGA, 2-way Infrared port, TV out, USB (2)
- One-year extendible warranty
- Microsoft Windows® 95 installed

Add \$400 for 13.3" XGA (1024 x 768)
TFT Active Matrix Color Display
Add \$159 for a 56K Fax/Data Modem

\$3599

Call Now: 800-846-6049
Mon-Fri 8am-9pm EST Sat 9am-4pm EST

U.S. sales only. 30-day unconditional money-back guarantee from date of purchase.

www.winbook.com. 800-846-6049

WinBook

Critically Proven.

©1997 WinBook Computer Corporation. All rights reserved. WinBook is a registered trademark of Micro Electronics, Inc. The Intel Inside logo and Pentium are registered trademarks and MMX is a trademark of the Intel Corporation. All other trademarks and registered trademarks are property of their respective corporations. All prices and specifications are subject to change without notice or obligation. Prices do not include shipping.

CIRCLE 085 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

HOW POWERFUL IS THE NEW DELL WORKSTATION?



Viewperf CDRS Benchmark[®] Test
Workstations – Relative Price Performance[†]

Dell	WorkStation 400 266MHz w/ELSA Gloria-M Glint MX	\$195
IBM	IntelliStation M Pro Model 26U INGR w/Intense 3D Pro 1000	\$220
Compaq	Professional Workstation 6000 Diamond Multimedia FireGL 4000	\$318
Sun Ultra	Ultra 1 Creator3D Model 170E w/Creator3D	\$446
SGI	O2 R5000/180MHz SCO2	\$533
Digital	Personal Workstation 286 w/AccelGraphics AccelPro 2500TX	\$624
SGI	Octane 1x175MHz R10000 SI w/Tram	\$922

[†]Price per composite score. Lower number indicates greater price value. For more in-depth information, refer to www.specbench.org/gpc/opc/cdr/s/summary.html

Dell's expertise in industry-standard technology gives the Dell WorkStation 400 a price performance edge over selected models from significant competitors. This chart reflects a 3D-graphics-oriented benchmark modeling an environment similar to mechanical CAD.





Fasten your seatbelts. Because the Dell® WorkStation 400 is built for speed. From its high-bandwidth dual independent bus architecture to its single or dual fast, new 266 or 300 MHz Intel Pentium® II processors, the word is "go." Even in the midst of the demanding data and graphics applications, it always feels like there's power to spare. And there is, thanks to all the high-performance industry-standard components inside. Like the 3D, financial modeling, CAD, authoring and animation video cards and even enhanced audio capabilities such as integrated 16-bit SoundBlaster Compatible Sound. But the real rush comes from the fact that your Dell WorkStation 400 can be custom-built for you from the ground up. And is backed by a \$8.7 billion global company* that can support it (and your company) in every way. With system engineering, 24x7 technical hardware telephone and online support, consulting, global integration, leasing, and asset management. The Dell WorkStation 400 comes with everything you'd expect in a workstation. Except, of course, the usual price tag.

ADVANCED APPLICATIONS WORKSTATION

DELL® WORKSTATION 400M

- 266MHz Pentium® II Processor (Dual Processor Capable)
- 64MB ECC EDO DIMM Memory
- 2GB Ultra/Wide SCSI-3 Hard Drive (7200 RPM)
- Matrox Millennium II PCI with 4MB Dual Ported VRAM Memory
- 1000LS Monitor (15.9" v.i.s.)
- 24X Max/12X Min Variable EIDE CD-ROM Drive
- Integrated 16-bit SoundBlaster Compatible Sound
- Integrated 3Com® 10/100 EtherLink® Controller
- Factory Installed Windows NT® 4.0 with 1 Year Telephone Support
- 3 Year Limited Warranty¹ with 3 Years Next-Business-Day On-site² Service

\$3999

Order Code: 900007

FINANCIAL SERVICES WORKSTATION

DELL WORKSTATION 400M

- 300MHz Pentium II Processor (Dual Processor Capable)
- 64MB ECC EDO DIMM Memory
- 4GB Ultra/Wide SCSI-3 Hard Drive (7200 RPM)
- Appian Jeronimo J2 Graphics Card
- Two 1000LS Monitors (15.9" v.i.s.)
- 24X Max/12X Min Variable EIDE CD-ROM Drive
- Integrated 16-bit SoundBlaster Compatible Sound
- Integrated 3Com 10/100 EtherLink Controller
- Factory Installed Windows NT 4.0 with 1 Year Telephone Support
- 3 Year Limited Warranty¹ with 3 Years Next-Business-Day On-site² Service

\$5879

Order Code: 900009

FINANCIAL SERVICES WORKSTATION

DELL WORKSTATION 400M

- Dual 300MHz Pentium II Processors
- 128MB ECC EDO DIMM Memory
- 4GB Ultra/Wide SCSI-3 Hard Drive (7200 RPM)
- Appian Jeronimo J2 Graphics Card
- Two 1000LS Monitors (15.9" v.i.s.)
- 24X Max/12X Min Variable EIDE CD-ROM Drive
- Integrated 16-bit SoundBlaster Compatible Sound
- Integrated 3Com 10/100 EtherLink Controller
- Factory Installed Windows NT 4.0 with 1 Year Telephone Support
- 3 Year Limited Warranty¹ with 1 Year Next-Business-Day On-site² Service
- ★ **Upgrade to 3 Years Next-Business-Day On-site² Service for \$99.**

\$7379

Order Code: 900002

TO ORDER TOLL-FREE

800-934-1955

TO ORDER ONLINE

www.dell.com

Mon-Fri 7am-9pm CT

Sat 10am-6pm CT

Sun 12pm-5pm CT

In Canada: call 800-839-0148

GSA Contract #GS-35F-4076D

Keycode #04556

DELL®

www.dell.com

*Prices and specifications valid in the U.S. only and subject to change without notice. †For a complete copy of our limited warranties, please write Dell USA L.P., One Dell Way, Round Rock, TX 78682, Attn: Warranties.

¹On-site service provided by third-party providers and may not be available in certain remote areas. 3Com and EtherLink are registered trademarks of 3Com Corporation. ²Reported revenues for last four fiscal quarters.

³Copyright 1997, Standard Performance Evaluation Corporation. Information value correct as of print date. Intel, the Intel Inside logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. Windows and Windows NT are registered trademarks of Microsoft Corp. ©1997 Dell Computer Corp. All rights reserved.

Second Looks

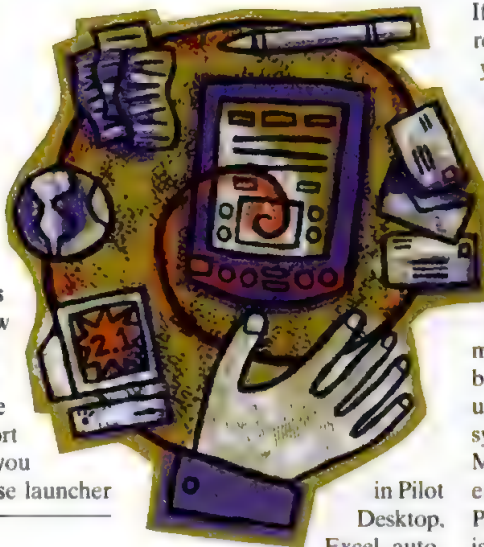
PALMPILOT

A Better Desktop

Since we first looked at U.S. Robotics' PalmPilot Professional Edition (First Looks, April 22, 1997), much has ensued around this organizer. In August, U.S. Robotics introduced PalmPilot Desktop 2.1 and HotSync Manager 2.01 (downloadable from www.usr.com/palm). Both of these updates provide PalmPilot Professional and Personal users with new features and fixes for old-

problems.

These updates provide compatibility with Microsoft Word 97 and Excel 97, so Desktop 2.1's drag-to feature now works with these two programs. Updated Pilot Expense modules also support Excel 97: When you click on the Expense launcher



in Pilot Desktop,

Excel auto-

matically launches. An expense report is generated if data exists. Mileage in expense reports is now properly recorded as mileage, not currency data as in the previous version. One glitch:

If you drag a large number of records to the Excel icon in Pilot, you will notice screen flicker and slow transfer speeds. The vendor is currently working on this problem.

Version 2.1 provides mail enhancements, including support for Eudora 3.0.1. It now allows PalmPilot Mail to synchronize and download e-mail properly with multiple text items generated by Lotus cc:Mail. The 2.1 upgrade also fixes previous synchronization problems with Microsoft's Exchange 4.0 e-mail clients on PalmPilot Professional. This free upgrade is intended for PalmPilot Personal and Professional users with Version 2.0 of the PalmPilot Desktop and HotSync Manager 2.0 running on a Windows 95 or Windows NT PC. —Carol Venezia

NETSCAPE COMMUNICATOR

4.02 and Counting...

Since we first reviewed Netscape Communicator (First Looks, August 1997), the product has gone through two revisions. Version 4.01 was released to fix a security hole. Now Version 4.02 has been released, and it includes the final version of the Netcaster push client.

Even though the Netcaster interface hasn't changed, channel offerings have increased exponentially. There are over 700 business and home channels available, including Marimba Castanet-based channels.

The channels are organized into 13 main categories, such as Business News, Home & Leisure, Lifestyle, Personal Finance, News, and Sports. The Channel Finder itself has also evolved. There are two separate menus—Business Focus and In General—and you can switch between them easily. These menus house the Premiere (read cash-supported) Channels.

Despite the fact that Netcaster is now fully developed, we noticed that the program has the

same tendency to crash that we experienced with the prerelease versions we tested. Fortunately, when we did crash, everything we had added prior to the crash was still there.

This tendency to crash may have been due to the fact that we didn't uninstall Communicator 4.01 before installing 4.02. According to many newsgroup post-

ings, failing to do so can lead to Java incompatibilities.

Navigator 4.02 does have one small problem, though. The browser seems less tolerant of HTML errors. The previous version would compensate for mismatched image file sizes in tables. Now, however, mistakes are seen as broken links. This may be a big headache for Webmasters but less of a problem for end users.

Netscape Communicator 4.02 is available as a free download (www.netscape.com); the registered version costs \$59. Netscape also offers a standalone version of the Navigator browser—including Netcaster—for \$39. —Karen J. Bannan



MICROSOFT OFFICE

Bridging the Gaps

One of the problems that many people face with constantly changing software is incompatibility—especially when the software that gets upgraded is as ubiquitous as Microsoft Word. Luckily, most publishers release updates or patches that solve the problem by acting as bridges between the old and the new. Microsoft has recently released its newest update: Microsoft Office 97 Service Release 1.

Although Service Release is primarily designed for business users, anyone who shares Word documents will want to download the update, because a major component of the patch is Word 6.0/95 Binary Converter for Word 97. This lets you save documents in either the native Word 6.0 format or Word 95. It is also available separately, so you can upgrade Word only.

Other features include an update to the Outlook 97 component, support for Intel's Pentium MMX processors, and a new way for Access users to send snapshots of reports to people who don't have the database program installed. The Outlook 97 improvement was designed to give users better support for POP3- and SMTP-based e-mail. Although we were unable to test the claim formally, another portion of the update, which deals with performance in handling electronic forms (using the Forms Fix Utility), was readily apparent. You can download the rather large 7MB file from the Microsoft Web site (www.microsoft.com). —KJB

SECOND LOOKS MAILBOX: Tell Second Looks about your experiences with computer products. Contact Carol Venezia at cvenezia@zd.com.

“I don't know how he
does it, but Maurice, my account manager at **CDW**,
always comes up with **product**
alternatives
”
that save my company money.

There's someone at our place who can help you select what you need without wasting money.

He's your CDW account manager. Once he gets to know you, your company's purchase history and your system, he can turn you on to product options that are more cost-effective and productive for your company. And save you a lot of time and aggravation in the process.

Get more than just a great price.

For example, he'll answer your toughest compatibility questions before they become problems. Get you the **free tech support**

you need before you need it. And, of course, line up the right price for you.

So give us a call. We'll set you up with your own product options expert. A business computer specialist who knows what's happening with all the different products from all the different manufacturers.

That way, your company can choose from a huge selection of brand-name products like **IBM**®, **Compaq**®, **Hewlett-Packard**®, **Toshiba**® and **Microsoft**® at the best prices, in stock, ready for overnight delivery, and easy credit. You'll also get someone who can help you make the most of it all. And some honest, friendly, professional advice that will save you more than money.

Call today and get some free, objective advice and a free CDW catalog.

Check out some of our products and prices in the back of the magazine. Then give us a call. We'll send you our complete catalog. Or check us out at **www.cdw.com**. We think you'll discover that when it comes to getting the right, unbiased advice, as well as the right price, CDW is your only viable alternative.



**COMPUTER
DISCOUNT
WAREHOUSE**

*Get the right price.
Get the right advice.
Get the right system.*

800-785-4239 See our ad in the back.

CDW[®] and COMPAQ offer you a rare sales tool. It's called double coverage.

CDW and Compaq offer the perfect balance of solutions, savings and selection.

With **Compaq**, you get more than just hardware. Compaq offers a wide range of high-quality desktops, notebooks, servers and networking solutions to meet all of your business needs. Compaq products are versatile, intelligent, expandable and above all, powerful. Each one is designed to maximize your access to information and people—all at a lower cost of ownership. And, by partnering with industry leaders like Microsoft and Novell, Compaq provides a strong foundation for your company.

At **CDW**, we'll give you more than just a great price. We'll set you up with your own personal account manager who'll offer honest, friendly and professional advice that'll save you more than money. We'll custom configure your new computer purchase—we'll even ship it the same day you buy it. Our team of Compaq-trained technicians will offer up their expertise and support should you need it. And we'll provide you the comfort of knowing that CDW is one of the leading direct resellers of Compaq products—we know Compaq like no one else.

Notebooks



Armada 1530DM

133MHz Pentium MMX
16MB RAM/1.4GB HD
10X CD-ROM
12.1" dual scan
33.6K bps modem
16-bit sound

\$2499.00 CDW 91507

1550DMT 133MHz/16MB/1.4GB

CDW 87070 **\$2999.00**

1580DMT 150MHz MMX/16MB/2GB

CDW 90959 **\$3499.00**



Armada 4150

150MHz Pentium MMX
16MB RAM/1.6GB HD
optional CD-ROM
12.1" dual scan
optional modem
16-bit sound

\$2999.00 CDW 91508

4131T 133MHz/16MB/1.4GB

CDW 80775 **\$2849.00**

4160T 166MHz MMX/16MB/2GB

CDW 91509 **\$3999.00**



Armada 7350MT

166MHz Pentium MMX
32MB RAM/2.1GB HD
optional CD-ROM
12.1" SVGA active matrix
33.6K bps modem
16-bit sound

\$4499.00 CDW 93736

7330T 150MHz MMX/16MB/2.1GB

CDW 93735 **\$3799.00**



LTE 5400

150MHz Pentium
32MB RAM/2.16GB HD
optional CD-ROM
12.1" SVGA active matrix
optional modem
16-bit sound

\$3199.00 CDW 78294

5380 133MHz/16MB/2.16GB

CDW 71119 **\$3999.00**



Armada 7710MT

150MHz Pentium MMX
16MB RAM/1.6GB HD
optional CD-ROM
12.1" active matrix
33.6K bps modem
16-bit sound

\$3699.00 CDW 88242

7730MT 166MHz MMX/32MB/2.1GB

CDW 88241 **\$4799.00**

7750MT 166MHz MMX/32MB/2.1GB

CDW 88240 **\$4999.00**



"Together
CDW and **Compaq**
comprise a powerful
partnership—
providing **solutions**
for all of your computing needs."

Desktops

4-YEAR service plan for **Only \$269!**

Should you have a computer problem,
simply make one TOLL-FREE CALL!

Call your CDW
account manager for details!



Deskpro 2000

Desktop
166MHz MMX Pentium
256KB L2 cache
16MB SDRAM
2.1GB EIDE hard drive
Optional CD-ROM
1MB SGRAM
Windows 95
Intelligent Manageability
3-year limited warranty
\$1199.00 CDW 92269
200MHz MMX/16MB/2.1GB
CDW 92840 **\$1389.00**
233MHz MMX/32MB/3.2GB/16X
CDW 92843 **\$1949.00**

Deskpro 4000

Desktop
200MHz MMX Pentium
512KB L2 cache
32MB SDRAM
2.4GB Ultra ATA hard drive
Optional CD-ROM
2MB SGRAM
Windows 95
Enhanced Intelligent Manageability
3-year limited warranty
\$1689.00 CDW 92847
166MHz MMX/16MB/2.4GB
CDW 92844 **\$1389.00**
233MHz PIII/32MB/2.5GB/16X
CDW 88475 **\$2319.00**

Deskpro 6000

Desktop
266MHz Pentium II
512KB L2 cache
32MB EDO RAM
4.2GB Ultra SCSI hard drive
8X CD-ROM
2MB Matrox Millennium graphics
Windows NT Workstation V4.0
Enhanced Intelligent Manageability
3-year limited warranty
\$3179.00 CDW 88474
233MHz PIII/32MB/2.1GB
CDW 88473 **\$2629.00**

Your one-stop source.

CDW is the #1 reseller of
Compaq products in the
direct marketing channel.

We've got the best selection of
Compaq computers at the right
prices, in stock and ready for
overnight delivery. And we have all
of the software and peripherals you
need to custom-build
your system. We'll
even take care of
the hard stuff like
installation and
technical support...free.

Just give us a call.

Professional Workstation 6000

Desktop
Mini-tower
266MHz Pentium II
512KB L2 cache
32MB EDO RAM
2.1GB Wide-Ultra SCSI hard drive
16X CD-ROM
4MB WRAM
10/100 Ethernet
Windows NT Workstation V4.0
3-year limited warranty
\$4389.00 CDW 91039
266MHz PII/64MB/4.3GB
CDW 91042 **\$5319.00**
300MHz PII/128MB/4.3GB
CDW 94163 **\$12,685.33**

Professional Workstation 8000

Mini-tower
200MHz Pentium Pro
512KB L2 cache
128MB EDO RAM
4.3GB Wide-Ultra SCSI hard drive
16X CD-ROM
4MB WRAM
10/100 Ethernet
Windows NT Workstation V4.0
3-year limited warranty
\$11,678.09 CDW 91048
200MHz Pentium Pro/4.3GB/16X
CDW 91050 **\$14,359.28**

Prosignia 200

Mini-tower
233MHz Pentium II
512KB L2 cache
32MB EDO RAM
Wide-Ultra SCSI HD controller
16X CD-ROM
10/100 Ethernet
Compaq Insight Manager
SmartStart server configuration
3-year limited on-site warranty
\$2358.00 CDW 94121
166MHz/16MB/EIDE
CDW 81958 **\$1193.00**
166MHz/16MB/SCSI
CDW 83144 **\$1591.00**

Presario Z200

Desktop
180MHz with Media GX technology
16MB EDO RAM
1.6GB EIDE hard drive
33.6K bps modem
8X CD-ROM
MPEG full-motion video
Windows 95
Microsoft Works/Quicken SE
1-year limited warranty
\$799.00 CDW 92852

Presario 4505

Mini-tower
166MHz Pentium MMX
256KB L2 cache
16MB SDRAM
2.1GB EIDE hard drive
16X CD-ROM
33.6K bps modem
Windows 95
Microsoft Works/Bookshelf/Encarta 97
1-year limited warranty
\$999.00 CDW 95066
4814/233MHz MMX/6.5GB/32MB CDW 90512 **\$1999.00**

Free
configuration
of your
computer
purchase!



**COMPUTER
DISCOUNT
WAREHOUSE**

The right price.
The right advice.

800-785-4239 See our ad in the back

Monitors shown sold separately.

CDW® has the brands you

Notebooks

Model	Processor	RAM	Hard drive	CD-ROM	Color display	Modem	Pointing device	Features	Price	CDW
Acer Texas Instruments										
Extensa 610CD	150MHz Pentium	16MB/64MB	1.4GB	10X	11.3" dual scan	-	touch pad	external floppy	\$1964.67	88530
Extensa 610CDT	150MHz Pentium	16MB/64MB	1.4GB	10X	11.3" active matrix	-	touch pad	external floppy	\$2549.24	88531
Extensa 670CD	166MHz Pentium MMX	16MB/80MB	1.6GB	10X	12.1" dual scan	-	touch pad	16-bit stereo sound	\$2699.29	95273
Extensa 670CDT	166MHz Pentium MMX	32MB/80MB	2.1GB	10X	12.1" active matrix	-	touch pad	SVGA resolution	\$3598.46	95275
TravelMate 7060	166MHz Pentium MMX	32MB/64MB	2GB	10X	12.1" active matrix	33.6K bps	touch pad	16-bit stereo sound	\$4289.59	88471
TravelMate 7063NT	166MHz Pentium MMX	32MB/64MB	3GB	10X	12.1" active matrix	33.6K bps	touch pad	Windows NT V4.0	\$4849.88	88472
TravelMate 6160	166MHz Pentium MMX	32MB/96MB	2.1GB	10X	12.1" active matrix	33.6K bps	touch pad	external floppy	\$4699.28	81406

AST Ascentia

A60+	150MHz Pentium	16MB/80MB	1.44GB	10X	12.1" active matrix	-	SmartPoint touch pad	SRS 3D sound	\$2499.93	86918
A60+	150MHz Pentium	16MB/80MB	2.1GB	10X	12.1" active matrix	33.6K bps	SmartPoint touch pad	SRS 3D sound	\$2896.26	89532
A70+	150MHz Pentium MMX	16MB/80MB	1.44GB	10X	12.1" active matrix	33.6K bps	SmartPoint touch pad	SRS 3D sound	\$2887.70	86919
A70+	150MHz Pentium MMX	16MB/80MB	2.1GB	10X	12.1" active matrix	33.6K bps	SmartPoint touch pad	SRS 3D sound	\$3568.96	89533
P70	150MHz Pentium MMX	32MB/80MB	2.1GB	10X	12.1" active matrix	28.8K bps	SmartPoint touch pad	32-bit PCI bus	\$3299.73	87580
P80	166MHz Pentium MMX	32MB/80MB	3GB	10X	12.1" active matrix	28.8K bps	SmartPoint touch pad	32-bit PCI bus	\$3759.84	87829

Compaq Armada

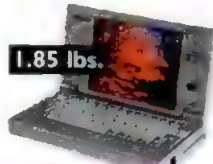
1530DM	133MHz Pentium MMX	16MB/80MB	1.4GB	10X	12.1" dual scan	33.6K bps	touch pad	full duplex speakerphone	\$2499.00	91507
1550DMT	133MHz Pentium	16MB/80MB	1.4GB	10X	12.1" active matrix	33.6K bps	touch pad	full duplex speakerphone	\$2999.00	87070
1580DMT	150MHz Pentium MMX	16MB/80MB	2.1GB	10X	12.1" active matrix	33.6K bps	touch pad	full duplex speakerphone	\$3499.00	90859
4130T	133MHz Pentium	16MB/48MB	1.08GB	-	11.8" active matrix	-	touch pad	16-bit stereo sound	\$2487.23	71118
4131T	133MHz Pentium	16MB/48MB	1.4GB	-	12.1" active matrix	-	touch pad	16-bit stereo sound	\$2849.00	80775
4150	150MHz Pentium MMX	16MB/80MB	1.6GB	-	12.1" dual scan	-	touch pad	16-bit stereo sound	\$2999.00	91508
4160T	166MHz Pentium MMX	16MB/80MB	2GB	-	12.1" active matrix	-	touch pad	16-bit stereo sound	\$3999.00	91509
7330T	150MHz Pentium MMX	16MB/128MB	2.1GB	-	12.1" active matrix	-	EasyPoint III track stick	16-bit stereo sound	\$3799.00	93735
7350MT	150MHz Pentium MMX	32MB/128MB	2.1GB	-	12.1" active matrix	33.6K bps	EasyPoint III track stick	16-bit stereo sound	\$4499.00	93736
7710MT	150MHz Pentium MMX	16MB/144MB	1.6GB	optional	12.1" active matrix	33.6K bps	EasyPoint III track stick	64-bit PCI bus	\$3699.00	88242
7730MT	166MHz Pentium MMX	32MB/144MB	2.1GB	optional	12.1" active matrix	33.6K bps	EasyPoint III track stick	64-bit PCI bus	\$4599.00	88241
7750MT	166MHz Pentium MMX	32MB/144MB	2.1GB	optional	12.1" active matrix	33.6K bps	EasyPoint III track stick	64-bit PCI bus	\$4899.00	88240

Compaq Presario

1210	150MHz Pentium	16MB/80MB	1.4GB	14X	12.1" dual scan	33.6K bps	touch pad	16-bit stereo sound	\$1999.00	90514
1610	150MHz Pentium MMX	16MB/80MB	1.6GB	14X	12.1" dual scan	-	touch pad	16-bit stereo sound	\$2699.00	90515
1620	166MHz Pentium MMX	16MB/80MB	2.1GB	20X	12.1" dual scan	56K bps	touch pad	16-bit stereo sound	\$2999.00	90598
1585DMT	150MHz Pentium MMX	16MB/80MB	2.1GB	12X	12.1" active matrix	33.6K bps	touch pad	16-bit stereo sound	\$3499.00	92232

Fujitsu LifeBook

435Dx	133MHz Pentium MMX	16MB/80MB	1.3GB	10X	12.1" dual scan	-	touch pad	SVGA resolution	\$1999.00	82945
555Tx	150MHz Pentium MMX	16MB/80MB	2GB	10X	12.1" active matrix	33.6K bps	GlidePoint touch pad	16-bit stereo sound	\$3499.00	85008
565Tx	166MHz Pentium MMX	32MB/96MB	2GB	20X	12.1" active matrix	33.6K bps	GlidePoint touch pad	XGA resolution	\$4299.00	92055
635Tx	133MHz Pentium MMX	16MB/80MB	2GB	16X	12.1" active matrix	33.6K bps	touch pad	16-bit stereo sound	\$3199.00	92058
655Tx	150MHz Pentium MMX	16MB/80MB	1.3GB	8X	12.1" active matrix	33.6K bps	touch pad	external floppy	\$3799.00	85013
656Tx	150MHz Pentium MMX	16MB/80MB	2GB	16X	12.1" active matrix	33.6K bps	touch pad	SVGA resolution	\$4299.00	92061



COMPAQ	COMPAQ	HITACHI	TOSHIBA	TOSHIBA	TOSHIBA
Armada 1530DM • 133MHz Intel Pentium® MMX • 16MB RAM standard, expandable to 80MB • 1.4GB hard drive • 10X CD-ROM drive • 12.1" dual-scan color display • 33.6K bps data/fax modem \$2499.00 CDW 91507	Armada 7730MT • 166MHz Intel Pentium® MMX • 32MB RAM standard, expandable to 144MB • 2.1GB hard drive • Optional 8X CD-ROM drive • 12.1" active-matrix color display • Integrated 33.6K bps data fax modem with DSVF \$4399.00 CDW 88241	VisionBook Plus 4140 • 133MHz Intel Pentium® • 16MB RAM • 1.4GB hard drive • 10X CD-ROM drive • 12.1" dual-scan color display • 33.6K bps data/fax modem \$1799.00 CDW 91046	Libretto 50CT • 75MHz Intel Pentium® • 16MB EDO DRAM standard, expandable to 32MB • 772MB hard drive • 1.44MB external 3.5-inch PC card • 6.1" active-matrix display \$1929.45 CDW 90350	Tecra S10CDT • 133MHz Intel Pentium® • 16MB EDO RAM standard, expandable to 144MB • 2.02GB hard drive • 10X CD-ROM drive • 12.1" active-matrix SVGA color display • 28.8K bps data/fax modem \$2659.76 CDW 77241	Satellite Pro 440CDX • 133MHz Intel Pentium® MMX • 16MB EDO standard, expandable to 144MB • 1.34GB hard drive • 10X CD-ROM drive • 12.1" FastScan dual-scan color display \$2359.54 CDW 90351

know at prices you love!

Notebooks

Model	Processor	RAM std./max	Hard drive	CD-ROM	Color display	Modem	Pointing device	Features	Price	CDW
Hitachi VisionBook										
4140	133MHz Pentium	16MB/128MB	1.4GB	10X	12.1" dual scan	33.6K bps	touch pad	16-bit stereo sound	\$1799.00	91046
4150x	150MHz Pentium MMX	16MB/128MB	1.4GB	10X	12.1" dual scan	33.6K bps	touch pad	16-bit stereo sound	\$2499.00	91047
4360x	166MHz Pentium MMX	16MB/128MB	2.1GB	10X	12.1" active matrix	33.6K bps	touch pad	SVGA resolution	\$3499.00	91049
7340	133MHz Pentium MMX	16MB/144MB	1.4GB	10X	12.1" active matrix	56K bps	GlidePoint touch pad	16-bit stereo sound	\$3199.00	91051
7380	166MHz Pentium MMX	32MB/144MB	2.1GB	10X	12.1" active matrix	56K bps	GlidePoint touch pad	16-bit stereo sound	\$4499.00	91053
7560	166MHz Pentium MMX	32MB/144MB	3GB	10X	13.3" active matrix	56K bps	GlidePoint touch pad	XGA resolution	\$4999.00	91054
8560	166MHz Pentium MMX	16MB/80MB	2.1GB	10X	13.3" active matrix	56K bps	GlidePoint touch pad	XGA resolution	\$4799.00	91056

Hewlett-Packard OmniBook Notebook PCs

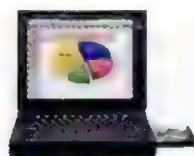
800CT	166MHz Pentium MMX	16MB/80MB	2GB	-	10.4" active matrix	-	TrackPoint III track stick	external floppy	\$3679.00	85727
5700CT	150MHz Pentium MMX	16MB/128MB	1.86GB	optional	12.1" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$3597.52	85720
5700CT	166MHz Pentium MMX	16MB/128MB	1.86GB	optional	12.1" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$4039.53	85721
5700CTX	166MHz Pentium MMX	16MB/128MB	1.86GB	optional	12.1" active matrix	-	TrackPoint III track stick	XGA resolution	\$4098.82	85723
5700CTX	166MHz Pentium MMX	32MB/128MB	2.79GB	optional	12.1" active matrix	-	TrackPoint III track stick	XGA resolution	\$4574.01	85722

IBM ThinkPad

380	150MHz Pentium	16MB/80MB	1.08GB	optional	12.1" dual scan	-	TrackPoint III track stick	16-bit stereo sound	\$1699.44	86302
3800	150MHz Pentium	16MB/80MB	1.35GB	8X	12.1" dual scan	-	TrackPoint III track stick	16-bit stereo sound	\$1999.50	86304
3800	150MHz Pentium MMX	16MB/80MB	2.1GB	8X	12.1" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$3059.78	86305
560	133MHz Pentium	8MB/40MB	2.1GB	-	11.3" dual scan	-	TrackPoint III track stick	external floppy	\$1699.89	81184
560	133MHz Pentium	8MB/40MB	2.1GB	-	12.1" active matrix	-	TrackPoint III track stick	external floppy	\$2049.32	81186
560E	150MHz Pentium MMX	16MB/80MB	2.1GB	-	11.3" dual scan	-	TrackPoint III track stick	16-bit stereo sound	\$2599.66	89290
560E	166MHz Pentium MMX	16MB/80MB	2.1GB	-	12.1" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$4186.26	89291
760ED	133MHz Pentium	16MB/72MB	2.1GB	6X	12.1" active matrix	28.8K bps	TrackPoint III track stick	XGA resolution	\$3739.72	74862
760E	150MHz Pentium	16MB/72MB	2.1GB	optional	12.1" active matrix	28.8K bps	TrackPoint III track stick	XGA resolution	\$3578.40	74863
760XL	166MHz Pentium MMX	16MB/104MB	2.1GB	optional	12.1" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$3769.88	84102
760XL	166MHz Pentium MMX	32MB/104MB	2.1GB	optional	12.1" active matrix	-	TrackPoint III track stick	Windows NT V4.0	\$4064.04	84103
760XD	166MHz Pentium MMX	32MB/104MB	3GB	8X	12.1" active matrix	28.8K bps	TrackPoint III track stick	XGA resolution	\$4679.37	84101
765L	166MHz Pentium MMX	32MB/104MB	3GB	-	13.3" active matrix	-	TrackPoint III track stick	16-bit stereo sound	\$5098.39	89293
765D	166MHz Pentium MMX	32MB/104MB	3GB	8X	13.3" active matrix	28.8K bps	TrackPoint III track stick	Mwave DSP subsystem	\$4899.01	89292

Toshiba

Libretto 50CT	75MHz Pentium	16MB/32MB	772MB	-	6.1" active matrix	-	AccuPoint track stick	Lithium ion battery	\$1929.48	90350
Satellite 220CDS	133MHz Pentium	16MB/144MB	1.34GB	10X	12.1" dual scan	-	AccuPoint track stick	Lithium ion battery	\$1899.13	89777
Satellite Pro 440CDX	133MHz Pentium MMX	16MB/144MB	1.34GB	10X	12.1" dual scan	-	AccuPoint track stick	Lithium ion battery	\$2359.54	90351
Satellite Pro 440CDT	133MHz Pentium MMX	16MB/144MB	1.34GB	10X	12.1" active matrix	33.6K bps	AccuPoint track stick	Lithium ion battery	\$2799.55	90352
Satellite Pro 460CDT	166MHz Pentium MMX	32MB/160MB	2.02GB	10X	12.1" active matrix	33.6K bps	AccuPoint track stick	Lithium ion battery	\$3659.18	90353
Portege 300CT	133MHz Pentium MMX	32MB/64MB	1.5GB	-	10.4" active matrix	33.6K bps	AccuPoint track stick	external floppy	\$3369.40	80354
Portege 660CDT	150MHz Pentium	16MB/80MB	1.2GB	10X	11.3" active matrix	28.8K bps	AccuPoint track stick	external floppy	\$3899.63	77243
Tecra 510CDT	133MHz Pentium	16MB/144MB	2.1GB	10X	12.1" active matrix	28.8K bps	AccuPoint track stick	16-bit stereo sound	\$2659.76	77241
Tecra 520CDT	166MHz Pentium MMX	32MB/160MB	2GB	10X	12.1" active matrix	33.6K bps	AccuPoint track stick	SVGA resolution	\$4159.45	90355
Tecra 530CDT	166MHz Pentium MMX	32MB/160MB	2GB	10X	12.1" active matrix	33.6K bps	AccuPoint track stick	XGA resolution	\$4578.17	90359
Tecra 730XCDT	150MHz Pentium MMX	16MB/144MB	2GB	10X	12.1" active matrix	28.8K bps	AccuPoint track stick	full duplex speakerphone	\$3499.77	80957
Tecra 740CDT	166MHz Pentium MMX	16MB/144MB	3GB	10X	13.3" active matrix	28.8K bps	AccuPoint track stick	video conferencing kit	\$4849.82	87964
Tecra 740CDT	166MHz Pentium MMX	16MB/144MB	3GB	10X	13.3" active matrix	28.8K bps	AccuPoint track stick	Windows NT V4.0	\$4899.31	87965



IBM®

IBM® ThinkPad® 380D

- 150MHz Intel Pentium®
- 16MB EDO RAM standard, expandable to 80MB
- 1.35GB hard drive
- 8X CD-ROM drive
- 12.1" dual-scan SVGA color display

\$1999.50 CDW 86304

IBM®

IBM® ThinkPad® 760XD

- 166MHz Intel Pentium® MMX
- 32MB EDO RAM standard, expandable to 104MB
- 3GB hard drive
- 8X CD-ROM drive
- 12.1" XGA active-matrix color display
- 28.8K bps data/fax modem

\$4679.37 CDW 84101



One great plan.
One great price.

Only \$269

Should you have a computer problem, simply make one TOLL-FREE CALL!

Call your **CDW** account manager for details!

CDW offers
FREE configuration
of your new
notebook purchase



COMPUTER
DISCOUNT
WAREHOUSE

The Best Price.
The Right Place.

800-785-4239 See our ad in the back



CDW

is the

#1

mail-order
reseller
of
Compaq,
Hewlett-
Packard,
IBM and
Toshiba
products!

CDW[®] offers the perfect balance

Desktops

Model	Processor	Case	RAM std./max	Hard drive	CD-ROM	Video	Features	Price	CDW
Acer									
Network Ready	133MHz Pentium	desktop	16MB/128MB	1GB	optional	64-bit PCI accelerated	Intel LANdesk Manager	\$835.00	91863
Network Ready	166MHz Pentium	desktop	16MB/128MB	1GB	optional	64-bit PCI accelerated	Intel LANdesk Manager	\$870.00	91866
Network Ready	200MHz Pentium	desktop	32MB/128MB	2.1GB	optional	64-bit PCI accelerated	Intel LANdesk Manager	\$936.32	91867
AcerPower	133MHz Pentium	desktop	16MB/128MB	1.2GB	optional	64-bit PCI accelerated	Three year warranty	\$859.27	91868
AcerPower	133MHz Pentium	mini-tower	16MB/384MB	1.5GB	optional	64-bit PCI accelerated	Three year warranty	\$944.49	91874
AST Bravo									
LC 5166M	166MHz Pentium MMX	desktop	16MB/384MB	2GB	optional	ATI mach84 VT3	Two USB ports	\$1115.18	93288
MS 5166M	166MHz Pentium MMX	desktop	32MB/256MB	3GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1514.68	89552
MS 5166M	166MHz Pentium MMX	desktop	32MB/256MB	2GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1619.87	89553
MS 3000C/95	200MHz Pentium MMX	mini-tower	32MB/256MB	3GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1779.77	89573
MS 3000C/NT	200MHz Pentium MMX	mini-tower	32MB/256MB	3GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1879.98	89574
MS 3000C/95	200MHz Pentium MMX	desktop	32MB/256MB	3GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1896.89	91570
MS 3000C/NT	200MHz Pentium MMX	desktop	32MB/256MB	3GB	16X Max	ATI 3D RAGE II	Two USB ports	\$1799.25	91569
LC 6233	233MHz Pentium II	mini-tower	32MB/384MB	2GB	optional	S3 VIRGE/DX 3D	Two USB ports	\$2099.23	89108
LC 6233	233MHz Pentium II	mini-tower	32MB/384MB	2GB	optional	S3 VIRGE/DX 3D	Two USB ports	\$2197.23	89107
Compaq Deskpro 2000									
5166X/2100	166MHz Pentium MMX	desktop	16MB/384MB	2.1GB	optional	S3 Trio64V2/GX	Intelligent Manageability	\$1199.00	92269
5166X/3200	166MHz Pentium MMX	desktop	16MB/384MB	3.2GB	optional	S3 Trio64V2/GX	Intelligent Manageability	\$1309.00	92838
5166X/3200	166MHz Pentium MMX	mini-tower	16MB/384MB	3.2GB	16X Max	S3 Trio64V2/GX	Intelligent Manageability	\$1619.00	92839
5200X/2100	200MHz Pentium MMX	desktop	16MB/384MB	2.1GB	optional	S3 Trio64V2/GX	Intelligent Manageability	\$1389.00	92840
5200X/3200/CDS	200MHz Pentium MMX	mini-tower	32MB/384MB	3.2GB	16X Max	S3 Trio64V2/GX	Intelligent Manageability	\$1769.00	92842
5200X/3200	200MHz Pentium MMX	desktop	32MB/384MB	3.2GB	optional	S3 Trio64V2/GX	Intelligent Manageability	\$1579.00	92841
5233X/3200/CDS	233MHz Pentium MMX	desktop	32MB/384MB	3.2GB	16X Max	S3 Trio64V2/GX	Intelligent Manageability	\$1949.00	92843
Compaq Deskpro 4000									
5166X/2400	166MHz Pentium MMX	desktop	16MB/256MB	2.4GB	optional	S3 VIRGE/GX	Enhanced Manageability	\$1389.00	92844
5166X/3200	166MHz Pentium MMX	desktop	32MB/256MB	3.2GB	optional	S3 VIRGE/GX	Enhanced Manageability	\$1599.00	92845
5166X/3200/CDS	166MHz Pentium MMX	mini-tower	32MB/256MB	3.2GB	16X Max	S3 VIRGE/GX	Enhanced Manageability	\$1799.00	92846
5200X/2400	200MHz Pentium MMX	desktop	32MB/256MB	2.4GB	optional	S3 VIRGE/GX	Enhanced Manageability	\$1689.00	92847
5200X/3200	200MHz Pentium MMX	desktop	32MB/256MB	3.2GB	optional	S3 VIRGE/GX	Enhanced Manageability	\$1759.00	92848
6233X/2500/CDS	233MHz Pentium II	desktop	32MB/192MB	2.5GB	8X	Cirrus Logic	Enhanced Manageability	\$2319.00	88475
Compaq Deskpro 6000									
6200/4200/PDS	200MHz Pentium Pro	mini-tower	64MB/256MB	4.2GB	optional	Matrox Millennium	PD-CD Drive	\$3099.00	84271
6200/4200/PDS	200MHz Pentium Pro	desktop	32MB/256MB	4.2GB	optional	Matrox Millennium	PD-CD Drive	\$2789.00	84268
6233X/2150/PDS	233MHz Pentium II	desktop	32MB/192MB	2.15GB	optional	Matrox Millennium	PD-CD Drive	\$2629.00	88473
6266X/4200/CDS	266MHz Pentium II	desktop	32MB/192MB	4.2GB	8X	Matrox Millennium	Ultra SCSI	\$3179.00	88474
Compaq Presario									
2200	180MHz processor with MediaGX	desktop	16MB/64MB	1.6GB	8X	MPEG full-motion playback	stage equalization	\$799.00	92852
4505	166MHz Pentium MMX	mini-tower	16MB/64MB	2.1GB	16X Max	64-bit PCI accelerated	JBL Pro stereo speakers	\$999.00	95086
4508	200MHz Pentium MMX	mini-tower	24MB/64MB	3.2GB	16X Max	64-bit PCI accelerated	JBL Pro stereo speakers	\$1499.00	90510
4528	233MHz Pentium MMX	mini-tower	32MB/64MB	3.2GB	24X Max	64-bit PCI accelerated	JBL Pro stereo speakers	\$1799.00	90511
4814	233MHz Pentium MMX	mini-tower	32MB/256MB	6.5GB	24X Max	64-bit PCI accelerated	Creative Imaging	\$1999.00	90512
4824	233MHz Pentium MMX	mini-tower	32MB/256MB	6.5GB	24X Max	64-bit PCI accelerated	Zip drive	\$2399.00	90513
HP Vectra VE PC Series 3									
VE3 5/166	166MHz Pentium	desktop	16MB/192MB	1.6GB	optional	SIS 6205	64-bit PCI graphics	\$1058.87	91105
VE3 5/200	200MHz Pentium	desktop	16MB/192MB	1.6GB	optional	SIS 6205	64-bit PCI graphics	\$1049.00	91107



Acer	HEWLETT-PACKARD	HEWLETT-PACKARD	COMPAQ	COMPAQ	TOSHIBA
AcerPower Network Ready 4135WL • 200MHz Intel Pentium® • 32MB RAM standard • 2.1GB hard drive • 10BASE-T Ethernet card \$996.32 CDW 91867	HP Brio 8174 • 200MHz Intel Pentium® MMX • 32MB EDO RAM standard • 2.1GB EIDE hard drive • 16X Max EIDE CD-ROM \$1635.54 CDW 95058	HP Vectra VL Series 5 PC • 233MHz Intel Pentium® MMX • 16MB EDO RAM standard • 2.5GB hard drive • 3-year limited warranty \$1598.12 CDW 91120	Deskpro 2000 model 5166X/2100 • 166MHz Intel Pentium® MMX • 16MB EDO RAM standard • 2.1GB EIDE hard drive • 3-year limited warranty \$1199.00 CDW 92269	Presario 4505 • 166MHz Intel Pentium® MMX • 16MB SyncDRAM standard, • 2.1GB EIDE hard drive • 16X Max EIDE CD-ROM drive • 33.6K bps internal data/fax/voice modem \$999.00 CDW 95066	Equium 5230D • 233MHz Intel Pentium® MMX • 32MB EDO RAM standard • 3GB hard drive • 24X Max CD-ROM drive \$1798.36 CDW 95209

All monitors shown sold separately

of savings and selection.

Desktops

Model	Processor	Chassis	RAM std./max	Hard drive	CD-ROM	Video	Features	Price	CDW
HP Vectra VL PC Series 5									
VL5 5/166	166MHz Pentium MMX	desktop	16MB/192MB	2.5GB	8X	S3 Trio64	Two USB ports	\$1377.00	91115
VL5 5/200	200MHz Pentium MMX	desktop	32MB/192MB	2.5GB	8X	S3 Trio64	Two USB ports	\$1598.83	91119
VL5 5/233	233MHz Pentium MMX	desktop	16MB/192MB	2.5GB	optional	S3 Trio64	Two USB ports	\$1598.12	91120
VL5 5/166	166MHz Pentium MMX	mini-tower	16MB/192MB	2.5GB	8X	S3 Trio64	Two USB ports	\$1439.22	91121
VL5 5/233	233MHz Pentium MMX	mini-tower	32MB/192MB	4GB	optional	S3 Trio64	Two USB ports	\$1889.76	91123

HP Brio Series

8012	166MHz Pentium MMX	mini-tower	16MB/128MB	2.1GB	optional	S3 Trio 64V2	USB port	\$999.53	95050
8014	200MHz Pentium MMX	mini-tower	16MB/128MB	2.1GB	optional	S3 Trio 64V2	USB port	\$1154.35	95052
8017	233MHz Pentium MMX	mini-tower	32MB/128MB	3.2GB	optional	S3 Trio 64V2	USB port	\$1449.95	95053
8032	166MHz Pentium MMX	mini-tower	16MB/128MB	2.1GB	16X Max	S3 Trio 64V2	USB port	\$1149.54	95054
8034	200MHz Pentium MMX	mini-tower	32MB/128MB	2.1GB	16X Max	S3 Trio 64V2	MS Word 97	\$1419.35	95055
8037	233MHz Pentium MMX	mini-tower	32MB/128MB	3.2GB	24X Max	S3 Trio 64V2	MS Word 97	\$1649.54	95056
8172	166MHz Pentium MMX	mini-tower	16MB/128MB	2.1GB	16X Max	S3 Trio 64V2	MS Word 97	\$1379.29	95057
8174	200MHz Pentium MMX	mini-tower	32MB/192MB	2.1GB	24X Max	S3 Trio 64V2	MS Word 97	\$1635.54	95058
8175	200MHz Pentium MMX	mini-tower	32MB/192MB	2.1GB	24X Max	S3 Trio 64V2	MS Word 97	\$1749.63	95059
8177	233MHz Pentium MMX	mini-tower	32MB/192MB	4GB	24X Max	S3 Trio 64V2	MS Word 97	\$1869.90	95060
8178	233MHz Pentium MMX	mini-tower	32MB/192MB	6GB	24X Max	Matrox Millennium	MS Word 97	\$2117.37	95061

IBM Aptiva

G3D	233 MHz Pentium MMX	mini-tower	32MB/64MB	4.2GB	8X DVD	ATI 3D RAGE II	Intel Video Phone	\$2699.00	90535
S3C	233MHz Pentium MMX	mini-tower	32MB/64MB	4.2GB	16X Max	ATI 3D RAGE II	Space-saving design	\$2299.00	90537
S3S	233MHz Pentium MMX	mini-tower	48MB/64MB	6.4GB	24X Max	ATI 3D RAGE II	Space-saving design	\$2699.00	90538

IBM PC Series

PC 300GL	166MHz Pentium MMX	desktop	32MB/128MB	2.5GB	optional	Cirrus Logic 5446	Two USB ports	\$1359.46	94858
PC 300GL	166MHz Pentium MMX	desktop	16MB/128MB	2.5GB	optional	Cirrus Logic 5446	Two USB ports	\$1179.37	89298
PC 300GL	200MHz Pentium MMX	desktop	32MB/128MB	2.5GB	optional	Cirrus Logic 5446	Two USB ports	\$1474.74	95162
PC 300PL	166MHz Pentium MMX	desktop	32MB/384MB	2.5GB	optional	Matrox Mystique	Wake on LAN	\$1598.82	94010
PC 300PL	200MHz Pentium MMX	desktop	32MB/384MB	2.5GB	optional	Matrox Mystique	Wake on LAN	\$1649.23	94012
PC 300PL	200MHz Pentium MMX	desktop	32MB/384MB	4.2GB	24X Max	Matrox Mystique	Wake on LAN	\$1898.67	94014
PC 300PL	233MHz Pentium MMX	desktop	32MB/384MB	4.2GB	24X Max	Matrox Mystique	Wake on LAN	\$2159.92	94015
PC 300PL	166MHz Pentium MMX	mini-tower	32MB/384MB	2.5GB	optional	Matrox Mystique	Wake on LAN	\$1588.84	94019
PC 300PL	200MHz Pentium MMX	mini-tower	32MB/384MB	4.2GB	24X Max	Matrox Mystique	Wake on LAN	\$1897.95	94021
PC 300PL	233MHz Pentium MMX	mini-tower	32MB/384MB	4.3GB	24X Max	Matrox Mystique	Wake on LAN	\$2615.83	94023
PC 300XL	233MHz Pentium II	desktop	32MB/384MB	2.5GB	16X Max	S3 Trio64V2	Two USB ports	\$2296.14	86313
PC 300XL	233MHz Pentium II	desktop	32MB/384MB	2.5GB	optional	S3 Trio64V2	Ultra SCSI	\$1999.36	86314
PC 300XL	266MHz Pentium II	desktop	32MB/384MB	4.2GB	16X Max	S3 Trio64V2	Two USB ports	\$2659.12	86315
PC 300XL	266MHz Pentium II	desktop	32MB/384MB	4.3GB	16X Max	S3 Trio64V2	Two USB ports	\$2969.24	86316

Toshiba

Equium S160D	166MHz Pentium MMX	desktop	32MB/192MB	2.07GB	12X	2MB ATI 3D RAGE II	USB ports, DMI 2.0	\$1418.82	84248
Equium S200D	200MHz Pentium MMX	desktop	32MB/192MB	2.38GB	12X	2MB ATI 3D RAGE II	USB ports, DMI 2.0	\$1549.64	84249
Equium 6200D	200MHz Pentium Pro	desktop	32MB/128MB	2.95GB	12X	2MB S3 VIRGE 3D	USB ports, DMI 2.0	\$2118.60	84251
Equium 6200M	200MHz Pentium Pro	mini-tower	32MB/512MB	4.24GB	12X	2MB ATI 3D RAGE II+	USB ports, DMI 2.0	\$2479.47	84252
Equium 5230D	233MHz Pentium MMX	desktop	32MB/192MB	3GB	24X Max	2MB ATI 3D RAGE II+	USB ports, DMI 2.0	\$1798.36	95209
Equium 6230D	233MHz Pentium II	desktop	32MB/192MB	3GB	24X Max	2MB ATI 3D RAGE II+	USB ports, DMI 2.0	\$2199.43	95208
Equium 6260M	266MHz Pentium II	mini-tower	32MB/256MB	3.73	16X	4MB ATI 3D RAGE II+	USB ports, DMI 2.0	\$2569.07	93106
Infinia 7161	166MHz Pentium MMX	mini-tower	32MB/128MB	2.38GB	12X	2MB S3 VIRGE 3D	USB ports, SRS 3D sound	\$1649.89	84559
Infinia 7201	200MHz Pentium MMX	mini-tower	32MB/128MB	3GB	12X	2MB S3 VIRGE 3D	remote control, TV/FM card	\$1989.24	84560



IBM PC 100PL Series IBM PC 100XL

- 166MHz Intel Pentium® MMX
- 32MB SyncDRAM standard
- 2.5GB EIDE hard drive
- 2MB Matrox Mystique graphics

\$1588.64 CDW 94019

- 233MHz Intel Pentium® II
- 32MB EDO RAM standard
- 2.5GB EIDE hard drive
- 16X Max CD-ROM drive

\$1999.36 CDW 86314

All monitors shown sold separately

QUALITY EXPRESS SERVICE

One great plan. One great price.

Only \$269

Should you have a computer problem, simply make one TOLL-FREE CALL!

Call your CDW account manager for details!

CDW® offers
toll-free
technical support
for the life
of your PC

CDW COMPUTER DISCOUNT WAREHOUSE

800-785-4239 See our ad in the back

CDW
Honored by
PC Magazine

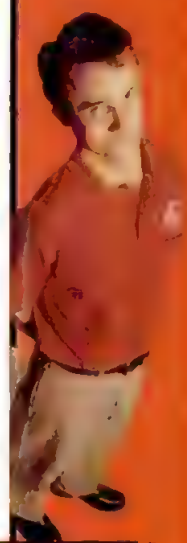
as
one of the



Top 100

Most Influential Companies

is the
computer
industry,
since 1977





Thin

is in.

Tomorrow's display. today.

ViewSonic VP140

- 14" Viewable
- Active matrix color LCD
- 1,024 x 768 max. resolution at 75Hz
- TCO Compliance
- Plug & Play

The ViewSonic VP140 ViewPanel® is equally at home as a desktop space saver or a slim line wall display. This ergonomically designed 14" Active Matrix LCD color display offers a full 14" viewable area—more than most traditional 15" displays. With a depth of only 2.5" and weighing a mere 12.1 pounds, the VP140 uses 90% less desktop space than a standard CRT

display. But for all its compactness, it's a big performer thanks to ViewSonic's LuCid™ technology which enables sharp, clear images and extraordinary brilliance (1,024 x 768 at 75Hz maximum resolution).

Be a leader, don't follow one.

Corporate America is jumping on the VP140 bandwagon. ***You can get a head start by calling (800) 888-8583, and asking for agent 6017 for the ViewSonic dealer nearest you.***



ViewSonic®
The Display Technology Company™

PC Sound: Does It Matter in Business?

Made any good presentations lately? If you have, you probably used PowerPoint or Freelance. You focused all your attention on the content of your slides and used wizards to help you manage bullet points, type sizes, and styles. You may have used a standard corporate

background or maybe included just a logo in the corner. And you probably used a notebook PC with fast graphics to drive a projector.

If you've had any training in giving presentations, you looked at your audience, not the projection screen. You used the computer screen as a small prompter and podium, not as a shield. You kept your hands out of your pockets and used gestures effectively. You made eye contact with your audience. You knew your material well, and your points flowed logically. You watched your audience for signs of boredom or confusion and adjusted your pace accordingly.

And you stood at the front of the room and bellowed.

You taxed the ears of those up close and strained the ears of the ones in back. I'll bet that you didn't give a moment's thought to the audio side of the presentation. In fact, your voice was probably the only audio component. By the time you were done, it was exhausted. And you didn't use music at all.

Isn't that strange, knowing how we use music to establish a frame of reference in virtually every other setting? Consider the organ in church, the anthem at the ball game, the theme music at the beginning of a movie, the staccato strains that tell you it's time for the news. And when you go to a professional seminar, they're playing music as you walk into the conference facility or auditorium.

Imagine how the members of that audience might have reacted differently, more positively, if they had entered the conference room to a jaunty, optimistic tune, a throbbing, up-to-the-instant beat, or a soothing refrain. Now imagine that each participant seated at that long conference table could hear your voice as though you were right in front of him or her, speaking to that individual alone. Welcome to the world of group listening.

Group listening is more than a buzzword. It's a design and engineering approach to a midsize audience. I've used plenty of sound systems geared to PC systems use. They've gotten quite good, but they're mostly geared to individual use, and they're effective for only two or three people. I

dearly love my Cambridge SoundWorks audio system, but it's the wrong tool for the conference room. It has the right attributes—small satellite speakers and a subwoofer—and it's sized right for portability. But for the conference room, I've seen something better—something that will get you noticed.

It's called the Presentation Audio System (PAS), and it's built by Mediaphile AV, a Minnesota-based design firm. Fujitsu, Transmonde, and others will sell the product this fall, but I was fortunate enough to get an early look. It's a three-piece audio system, but there the similarity ends. The two satellite speakers look like large, low mushrooms or perhaps small Japanese ceremonial lamps; they are hardly larger than a coffee mug. The cylindrical woofer goes on the floor. A third, smaller mushroom is the volume control. The pieces are prewired and foolproof. The suggested retail price will be around \$250.

You put the two mushrooms on the table, and the speakers fire down from the domes toward the table top. They're designed to couple acoustically with the table top, creating a relatively huge radiating surface and a stereo field that sounds pretty much the same everywhere around the table, even at the ends. The sound is spectacular. I listened to CD music from a notebook's player, and it was like listening to a high-end audio system, with excellent imaging and fidelity.

I plugged a Radio Shack tie-clip mike into the machine's microphone jack and adjusted the level from the notebook's audio mixer utility. The speaker's voice was right there at the table with me, no matter where I sat. It felt as though all of us at the table were seated inside a very good pair of headphones. The sound is equally good but less personal when the speakers are placed on a dais or table across the front of the room.

I don't think the world is ready for background music to reach crescendos as you make your points or to build, *Jaws*-like, toward suspenseful moments. But if you're ready to get inside your listeners' heads as never before, this may be the perfect product for you. **PC**



GROUP LISTENING

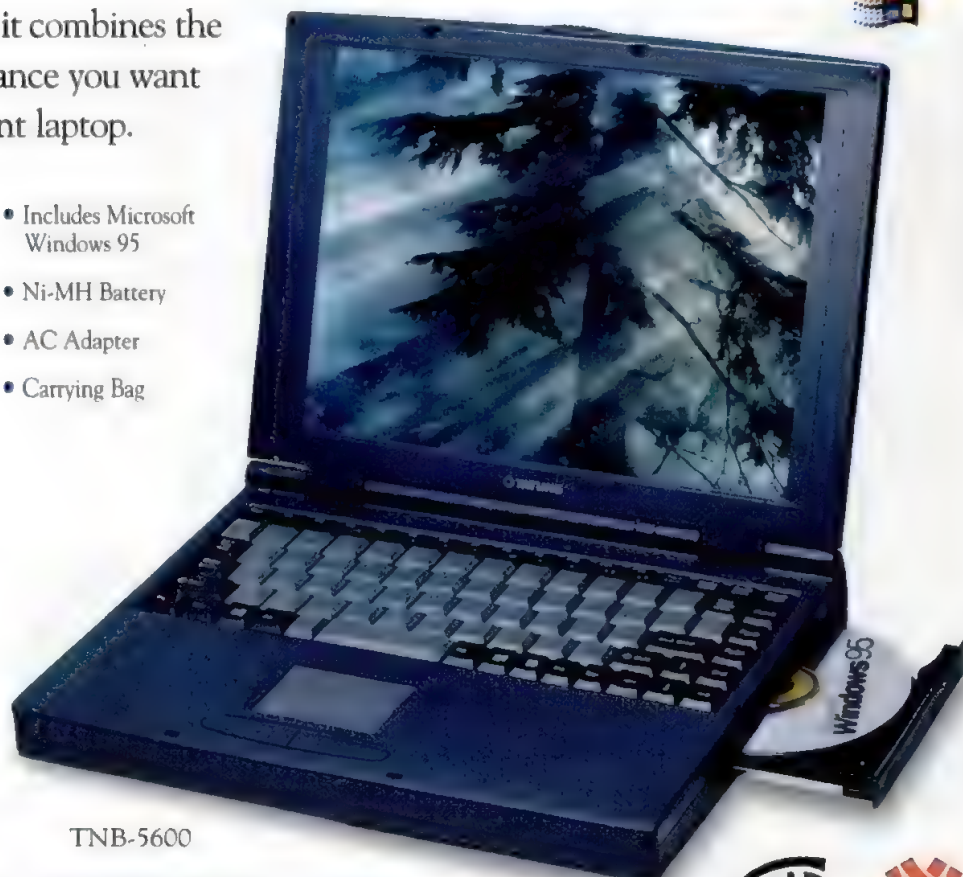
For \$250,
this prewired,
foolproof
presentation
audio system will
keep 'em awake.

Our Legacy Continues to Grow...

Tatung a company on the leading edge of technology since 1918 introduces the new TNB-5600.

Weighing only 6 lbs. it combines the features and performance you want into a slim and elegant laptop.

- 12.1" TFT LCD Display
- Up to 80MB EDO RAM
- 1.44MB Floppy Disk
- 1.08GB to 2.5GB EIDE Hard Disk
- 10X CD-ROM
- 16 Bit Stereo Sound
- 2 Speakers & Microphone
- 33.6 Fax / Modem
- PCMCIA Slots: 2 Type II, 1 Type III
- TrackPad Point Device
- Includes Microsoft Windows 95
- Ni-MH Battery
- AC Adapter
- Carrying Bag



TNB-5600

TNB-5500	TNB-5600
133MHz, 16MB RAM, 1.0GB HD \$2,250.00	133MHz MMX, 16MB RAM, 1.4GB HD \$2,425.00
150MHz, 16MB RAM, 1.4GB HD \$2,325.00	150MHz MMX, 16MB RAM, 1.4GB HD \$2,475.00
166MHz MMX, 16MB RAM, 1.4GB HD \$2,575.00	166MHz MMX, 16MB RAM, 2.0GB HD \$2,795.00
166MHz MMX, 16MB RAM, 2.0GB HD \$2,645.00	166MHz MMX, 32MB RAM, 2.0GB HD \$2,925.00



Toll Free Order Line
888-4TATUNG (888-482-8864)



Tatung a Company on the leading edge of technology since 1918

SEE US AT FALL COMDEX BOOTH #L3361



TNB-5500

Refresh My Memory

Intel was more than a little annoyed when I recently argued that the company was in the midst of an evil plot to take control of the memory business through Rambus (Inside Track, August 1997). What was I thinking? Intel had a few corrections to my

statements that it thought were needed—specifically, that the company does not own Rambus and that it will not be collecting any royalties from Rambus licensees. This was implied in my comments. Rambus was annoyed that I called the licensing fee a “tribute,” which I still think is a good synonym. Furthermore, the licensing of RDRAM technology amounts to a royalty of no more than 2 percent of the sales. All the major memory makers have taken out licenses, and they will have to live with RDRAM manufacturing, like it or not. And just to keep beating myself up on this issue: It appears that RDRAM will actually lower total system cost substantially, and thus it’s a good thing for users. You realize this immediately when you look at cards designed around RDRAM: There are virtually no chips on the cards.

With these facts in mind, I thought I might as well straighten out the rumors and tell you what I’ve since learned from Rambus.

Intel was looking for a way to speed up memory for the machines of the twenty-first century when it decided that Rambus had the best technology for the purpose. So Intel bought some warrants to purchase maybe as much as 4 percent of Rambus, and it joined with Rambus to specify future RDRAM designs. According to Intel and Rambus, the plot ends there, period. Although AMD and Cyrix appear to be out of the loop and at a disadvantage, Rambus assures me that no secret deals regarding any new designs are being made with Intel. As soon as AMD (or anyone else) wants to get in on the deal, it will be part of the new architecture. Since a look at Rambus’s management reveals a slew of AMD personnel, you can be sure this will happen. AMD probably is waiting just to see how things unfold before it mails in its multimillion-dollar fee.

Rambus represents a new generation of American companies within the semiconductor arena—the fabless semiconductor companies that develop difficult architectures and then license the designs to others. Former AMD executive Subodh Toprani, now vice president of marketing at Rambus, pointed out that although the U.S. has lost

the memory business to large Asian chip makers, Rambus represents a way to recapture part of it: 2 percent off the top, to be exact. So what’s wrong with that? I love it when companies bring patriotism to the table.

I’ve actually written a lot about Rambus over the years,

as the company has developed nothing less than a phenomenal way to speed up data transfer. The peak bandwidth is extraordinary: 600 MHz now, and gigahertz speeds are on the way. Apparently the technology is more like telecom transmission with packet data than like any normal memory I/O. The speeds achieved are so fast it’s important that the memory interconnects to the processor to minimize twists and turns. In the best designs, the processor is lined up with the RDRAM in a straight shot. Toprani estimates that it would cost a memory maker \$100 million to reinvent this technology. Apparently he’s right. It took Rambus about nine years of soaking up venture capital to develop what it now licenses.

In my discussions with graphics card makers, most have shied away so far from RDRAM at the high end. The only roadblock to RDRAM implementation in most PC graphics cards is something called latency—the amount of time it takes to get the first memory block—which is critical to the cards.

Still, the newest hot 3-D graphics cards coming onto the market—such as the Number Nine Revolution—use various forms of VRAM (for example, the unique

memory chip from Samsung referred to as Window RAM). And when you peek into the highest of the high-end machines that specialize in graphics, you find the pricey Mitsubishi 3-D RAM, which I’m told is simply too expensive to be used in PCs.

Currently you find the Rambus chips in the very low-end graphics cards, which is another argument for their cost-effectiveness. Rambus likes to think that even with the licensing fees and royalties, makers of RDRAM will actually save money and prices for all memory devices will continue to decline. This will give us a few more generations of lower prices for more power and capability.



I GOOFED!

Both Intel and Rambus have taken me to task over my August 1997 Inside Track column.

New 233-300 MHz Coolers! New Price Reductions!

Cool Computer Upgrades.

POWER SUPPLIES

"If you're building a machine you need to trust, go with PC Power & Cooling products. Get its case, power supply (the best, period), and CPU fan." John Dvorak, *PC Computing*, August, 1997.

ECONOMICAL

Save on quality UL/ULC approved power supplies!

STANDARD 230 SLIM \$59
STANDARD 235 ATX \$69
STANDARD 230 DESK or TOWER \$79

ULTRA-QUIET



Toss the earmuffs! The best way to get relief from a noisy computer is with a Silencer® power supply. Its high-efficiency fan reduces noise by up to 90%! A multimedia must.

SILENCER 230 SLIM \$69
SILENCER 235 ATX \$79
SILENCER 270 SLIM \$119
SILENCER 270 DESK or TOWER \$129
SILENCER 275 ATX \$129

HIGH-PERFORMANCE



For power that won't skip a beat during hard drive access or line voltage sags, upgrade your PC with a premium Turbo-Cool® power supply. You'll get 50%-100% more power, built-in line conditioning, super-tight regulation, ultra-clean output, enhanced cooling, UL/ULC/TUV, and 3-5 year warranty!

TURBO-COOL 300 SLIM \$119
TURBO-COOL 300 ATX \$129
TURBO-COOL 300 TOWER \$129
TURBO-COOL 400 SLIM or TOWER ... \$199
TURBO-COOL 400 ATX \$219
TURBO-COOL 600 TOWER **NEW!** \$399

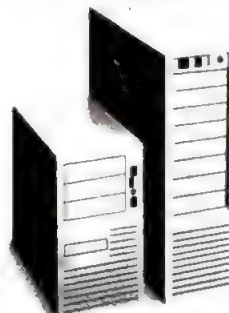
ENCLOSURES

ECONOMICAL



Now, with a single case, you can build your choice of either a Baby AT or ATX computer! Our new Personal Mid-Tower case features rigid construction, 6 drive bays (upgradable to 8), and easy-access side panels and M/B tray. A real deal! PERSONAL MID-TOWER **NEW!** \$69

PROFESSIONAL SERIES



For a great-looking, American-made enclosure—with superior rigidity, system cooling, and EMI suppression—choose from our Solid-Steel family!

SOLID-STEEL MINI (6 bays) \$169
SOLID-STEEL TOWER (10 bays) \$279
SOLID-STEEL TOWER ATX (10 bays) ... \$299

OVER-TEMP ALARM

Don't let a bad fan or a clogged filter cost you your system! Detect overheating, before damage occurs, with a 110 Alert™



110 ALERT \$19

REDUNDANT POWER



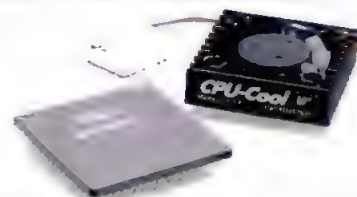
Get redundant 250W power, in 1 slim unit, with our economical Two-in-One 500.

For mission-critical reliability (5,000,000 hr. MTBF), choose from our hot-swappable TwinPower™ series!

TWO-IN-ONE 500 \$229
TWIN-POWER 800 ATX \$819
TWIN-POWER 1200 **NEW!** \$1089

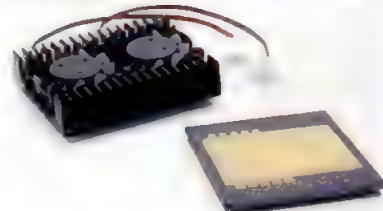
CPU COOLERS

PENTIUM® & 486



486s and Pentiums run hot, often exceeding 210°F! Cool'em by 90°F-120°F with genuine, low-profile CPU-Cool™ coolers. Each consists of a long-life, ball-bearing fan integrated into a patented, die-cast heat sink. Last 10X longer and are 40% thinner than cheap, bulky imitations! USA-made. 5-year warranty. CPU-COOL 1.9T (486, 75-133 P5) \$19
CPU-COOL 1.9W (150-200 P5) \$22
CPU-COOL 2.3W (150-200 AMD, Cyrix) \$23
CPU-COOL Z1 (All 233-300 Skt 7) **NEW!** \$27

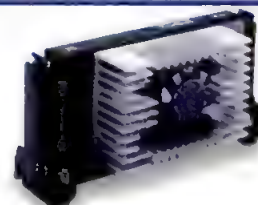
PENTIUM® PRO



	Sink/Ann. Fan	Std. Cooler	CPU-Cool 3.2	Dual CPU-Cool
Thermal Resist:	1.5°C/W	1°C/W	0.8°C/W	0.6°C/W
3-Yr. Fail Rate:	1:100	1:10	1:1,000	1:1,000,000

CPU-COOL 3.2 \$24
DUAL CPU-COOL (Fault-Tolerant) \$35

PENTIUM® II



Our new CPU-Cool K1 is one cool cooler! Thin (1.1"), effective (0.6°C/W vs. Intel's 0.8°C/W spec.), reliable (100,000+ hr. MTBF), and easy to install!

CPU-COOL K1 **NEW!** \$25

12th Year

PC POWER & COOLING, INC.

1985-1997

5995 Avenida Encinas, Carlsbad, CA 92008 • (760) 931-5700 • (800) 722-6555 • Fax (760) 931-6988

Web: <http://www.pcpowercooling.com>. Hours: 7 a.m.-6 p.m. (PT) Mon.-Fri. Terms: Visa, MC, COD, or PO. Warranty: 5-yrs. for CPU-Cool and Turbo-Cool 600; 3-yrs. for Turbo-Cool (except 600), 2-yrs. for all others. Silencer, Turbo-Cool, TwinPower, CPU-Cool, Dual CPU-Cool, and 110 Alert are trademarks or reg. trademarks of PC Power & Cooling, Inc. Pentium is a reg. trademark of Intel Corp. © 1997 PC Power & Cooling, Inc. CIRCLE 080 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

JOHN C. DVORAK

Inside Track

Last August, Bill Gates and some top Microsoft executives had a **secret meeting** with select editors and reporters at the Gates family Hood Canal retreat, a small enclave in Washington state most easily accessible by seaplane.

Writers from the **major media** and some trade journal editors went to this event and listened to Bill Gates and Steve Ballmer, among others, outline Microsoft's latest direction. Since **nobody could report** any of this—an odd arrangement for journalists to approve—the company was **more honest** about things than usual. Of course, most of the information was in the form of lectures, since the journalists asked few (if any) **hardball** questions—preferring to **back**, it seems, in the glow of Bill Gates. It was basically pathetic. Since, as a matter of policy, I do not sign NDAs, I don't get invited to such events and must get information on them the old-fashioned way—by asking around.

This event was almost two days long, and I believe that originally it was modeled on financier Herb Allen's famous retreat, which Bill has attended. Many of the anointed attendees **slept in the Gates compound** in one of the many cottages or in the main house. It was a **weird bonding event** at which people felt they had become part of an inner circle. The theory is that it's harder to write hard-edged stories when you're pals with Bill. Or when you *think* you are pals with Bill. This **coy plan** reflects the **continuing genius** of Waggener-Edstrom, Microsoft's PR group.

Weird and obtuse comments were made by Gates and his henchmen. Bill led the way with a number of rather screwball predictions that will **stun much of the industry** once they get out (**like now**). The most bizarre was his blanket comment made in front of everyone predicting that **Motorola will be out of the microprocessor business** in about two years. It's believed that he made this remark as justification for discontinuing Windows NT for the Power PC, but still! It was a **crazy** comment. Motorola, are you listening? Does Bill know something that we don't?

At lunch Gates was asked if he enjoys **crushing his opponents**, and he remarked that it was **fun to crush Philippe Kahn** shortly after Borland bought dBASE. During that era, Kahn was a **boaster** whom Bill apparently targeted.

He went on to describe his two current enemies as a "humorous guy" and a "ruthless guy." The **humorous guy is Scott McNealy**, whom Bill doesn't see as a threat. Ballmer made it clear that Sun's recent growth has been on the very high end of the market and the company isn't impinging on anything Microsoft is doing. So **the company ignores Sun**. The **ruthless guy is Larry**

*At lunch Gates was asked
if he enjoys crushing
his opponents. He remarked
that it was fun to crush
Philippe Kahn shortly after
Borland bought dBASE.
During that era, Kahn
was a boaster whom Bill
apparently targeted.*

Ellison, whom Bill apparently does not like one iota. Larry, are you listening? It seems that, of late, Ellison has managed to get Bill's goat, as it were. Look for Microsoft to target Ellison in the months ahead.

Gates also felt bad about his company's defeats in content development. Microsoft failed miserably in the CD-ROM business, pulling most of its titles off the market and killing its Microsoft Home moniker. The fact is that Microsoft has yet to understand content. And MSN, according to Bill, has been a **personal embarrassment** to date. He has high hopes for the third attempt, though.

The company believes it's **chipping away at Netscape**. During the retreat, Netscape announced its unbundling of Navigator 4.0 from

Communicator. In the press announcement, Netscape claimed it would distribute 100 million copies of Navigator. When Gates heard this, he remarked that it was just like Mike Homer (a former Apple marketing guy) "to add a couple of extra zeros."

Ballmer was not his normal high-energy self for some reason, but he did regale the crowd with the comment that he **should be CEO of Apple** so that he could turn it into a PC-clone company. It would then make some serious money. He's probably right.

Gates did share some visions of the future, although you have to wonder if he's not spread a little too thin to have any vision at all. He wants the OS of the future to be voice-activated, with both speech recognition and synthesis. Shades of the **IBM human-centric machine** suggested a few years back. Nothing new about that idea!

After that, everyone kissed and went home.

Genuinely Interesting Software Dept.: Hollywood's top script doctor, John Truby, has released a new version of his cool scriptwriting software package Write A Blockbuster. This incorporates his fascinating theories of story and genre, making it easy to put together a **cool multigenre screenplay**—the only kind that sells nowadays, I'm told. (*Men in Black*, for example, is a mix of sci-fi, comedy, and monster-movie genres. Result: cash.) This software package (\$295 list) helps you piece together a complex story, which you can then sell or put into the **bottom of your desk drawer** for the times when you need to show how hip you are. It's the best product on the market. I'd still advise getting the Truby tapes or taking a seminar if you're serious about a new career. Everyone needs a script that could be sold on the spot—just in case! If you've ever thought about showing off your **creative prowess**, then this guy is the ticket. Call Truby's Writers Studio at 310-575-3050 to get a copy or to sign up for one of his screenwriting seminars. This guy's the best, period. 

Made for each other.

The new Intel Pentium® II processor.



One processor was designed with your business software in mind. The new Pentium® II processor.

pentium® II It's the most powerful Intel processor available today. Which means greater performance from your traditional business applications. And the headroom for new applications, like those based on Java.® Its sleek new package incorporates

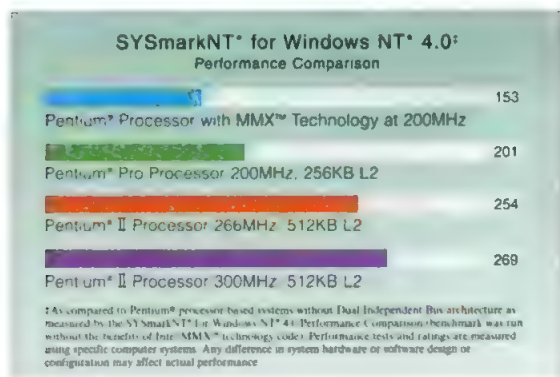
Intel's unique Dual Independent Bus architecture, an advanced design that uses two separate buses—one



linked to the L2 cache and the other dedicated to the main memory. The result is a boost in overall performance that allows you and your company to get more done. The Pentium II processor. Power that's made for today's business software.

To learn more, visit our Web site.

► www.intel.com/PentiumII



intel®
The Computer Inside.™





Vivid Imagination

Once again, Acer sets higher standards in performance, quality and value with the introduction of a new family of AcerView monitors designed to maximize your viewing experience. *Revolutionary Mini-Neck CRT Tubes* in selected models offer *Power Consumption Reductions Up to 46-Percent*, while Intelligent iScreen** design makes customizing your favorite settings a snap. *With Sizes Up to 17" (15.7" viewable), Optional Attached Speakers and Dot Pitch Ranges from .28 to .25*, AcerView has the perfect flicker-free model just for you. Backed by Acer's 3-year limited warranty and outstanding reputation for reliability, they're all *Windows® 95 Plug'n Play Compatible*. Call 1-800-379-2237, Ext. 123 today for the dealer nearest you to see the new monitors from AcerView that display images so vividly, you'll question reality.



AcerView™ Quality Monitors

CIRCLE 087 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

©Copyright 1997 Acer Components, a division of Acer America Corporation. All rights reserved. **iScreen not available with 35c or 55c models.

The Acer Components logo and AcerView are trademarks and iScreen is a registered trademark of Acer America Corporation and Acer Inc. Windows is a registered trademark of Microsoft Corporation. All other trademarks are the property of their respective owners. Vivid.PCM.6/97.123

The Age of the Perpetual Upgrade

The hype has died down a little, so we don't hear so many bombastic arguments about the future of the network computer. That's a good sign: People finally may be considering the idea of the NC on its own merits. As I've said in the past, NCs make sense for a

significant number of users in companies. I'm not trading in my desktop or notebook PCs for an NC, and you probably aren't either. Network computers are more limited than the machines we want and need, even though they're a good match for what a lot of other folks need.

The problem is, there just isn't much useful work that can be done on NCs yet. To paraphrase Cuba Gooding's character in *Jerry Maguire*, "Show me the software!" But that will change in early 1998.

For the past several months, I've been looking at demos of NC apps in the making, and in general, I'm impressed.

Initially, we won't see a lot of horizontal apps, because many early adopters of the network computer are assigning NCs to highly vertical, intracompany applications. The economic advantages of NCs are clear—even more so in life-cycle costs than purchase cost—when you look at many critical tasks, from getting packages ready for shippers' pickup to calculating insurance policy premiums or managing a hotel's front desk.

But that's not to say that we won't see ambitious and ultimately successful horizontal apps as well. Corel has been promising a forthcoming Java-based Corel Office Suite. By embedding bits of Corel's Barista technology into Corel Ventura and the existing WordPerfect component of Corel Office Pro, the company showed that it knows how to enable apps to write Java documents. The real test comes next spring, when that long-promised Corel Java suite is supposed to show up. Corel's opportunity is huge: If the company can produce an industrial-strength, feature-rich office tools suite written entirely in Java, it could own the core apps market for NCs.

Others, no doubt, have had the same thought. With the component architecture of Java/NC software, many shops are likely to let Corel lead the way, then try to snatch fractions of its business by selling better-than-Corel applets you could buy and graft onto the Corel superstructure.

But despite the clear usefulness, manageability, and economy of NCs, many corporate computing managers are scared to death of the threat that NCs pose to the

stability of their carefully built computing strategies.

The managers ask good questions—hard questions that have no self-evident answers—about this "Maybe Sort of Brave New World" of NC/Java computing. Software vendors that plan to play in this market, and to a greater extent

users like you and me—many of whom will soon have to deal with these issues—need to start thinking about these questions, too.

One of the tough questions concerns the way postsale support and product enhancement will work with Java-based component-design packages. Say you license Dynamite Presentations, a dazzling Java app designed for building and presenting NC slide shows, for your corporate users. The app goes up on the server, and your NC users start using it. When users load the app, a dynamically assembled set of Java applets goes down the wire to the users' NCs, and they use those components, knitted together on the fly, to design their shows.

How does NC Apps, the developer of Dynamite Presentations, charge for that software license? Not just the maximum number of users, or even the maximum number of simultaneous users—we've already figured out how to write those kinds of licenses. More interesting, complex, and troubling is the question of what happens as NC Apps works on its next version of the product and gets the new applets ready to deliver.

One business model would be simply for the company to post those new, tiny applets on its Web site as they're finished and let licensed users of the 1.0 package download and use them for free. A second option would be to sell—oops, license—the 1.0 package on an annual-fee basis, with new components developed during each year available on the Web to licensed users without additional charge. A third approach would be a cafeteria-line model: Once you've licensed the basic package, you can license new components as they become available.

All three models are flawed in important ways.

As a corporate manager or user, you'd love the first approach, because once you're in the game, everything's free.



COMING OF AGE
The economic advantages of NCs are clear—more so in life-cycle costs than purchase cost.

BOOKMARK Benchmarks!



www.pcmag.com

JIM SEYMOUR

But that's not workable for developers, who need ongoing income streams from their installed base to fund the continuing development of new components. The second approach, annual licenses, works well for the software developer: It provides a consistent and relatively predictable revenue model into the future but isn't great for licensees, who don't want to get hit with that annual re-licensing tab. Finally, letting licensed users add new components and replace old ones willy-nilly, for relatively modest additional amounts, is a mess for everyone. This approach results in complex licenses and difficult or impossible enforcement problems for developers—a chaotic state for users.

How will we solve this? My guess is that annual licensing, with free upgrade components for the duration of each annual license, is the best answer. We've seen that work in the mainframe-software business, and if the NC computing model looks like anything, it looks like the mainframe business.

How would you solve this? Send me your ideas; I'll see that they get into the right hands.

There's another aspect to the advent of component software that scares computing managers: the Age of Perpetual Upgrades. We're about to enter a period when major software developers will constantly dribble out to their users new and improved upgrades, some to fix problems and some to add features. Whole-number new releases—such as "Version 3.0"—will become an anachronism.

We already see this at work: Microsoft's frequent posting of new freebies for Windows and Microsoft Office apps on its Web site (www.microsoft.com/msdownload) has let users enjoy the benefits of new extensions and tweaks that used to be quietly slipped into shrink-wrapped product boxes. I can count almost a hundred of these add-ins, plug-ins, standalone apps, service releases, support packs, typefaces, and other valuable interim-update giveaways on the Microsoft site.

But for those who plan, buy, and manage corporate PC fleets, this anarchy—letting users choose whether, how, and when they'll plug these micro-upgrades into their systems—is terrifying. PC managers assemble stable, homogenous PC software environments; the Age of Perpetual Upgrades will undermine that work.

Individual users are going to have a lot more power to configure their individual software toolkits. And with that power comes a new and sometimes awkward responsibility. **PC**

Practical Sense for Road Warriors

Better than lip service. But still not real service. That's what it's like for notebook-toting road warriors these days when it comes to finding accommodating hotels and airlines. I'm sorry, but to me "business traveler's room" should mean more than two packets of

Starbucks-branded coffee next to the in-room coffee-maker and a copy of *USA Today* dropped outside the door (by the way, how does such a thin paper make such a big *thwack* at 4:00 A.M.?).

At airlines and airports, four fundamental things are lacking. Here's what I'd like to see that would make life better for road warriors. First, better seat pitch, which refers to the distance from your seat to the seat in front of you (so your LCD panel isn't at risk when the guy in front reclines his seat). I know that's never going to happen, but I have to mention it. Second, 12-volt power at all the seats on all the planes, not just in business and first class on transoceanic flights. (When you're flying domestically, coach is the class business flies.) Third, more carrels with phones, RJ-11 jacks, and AC power in the airline clubs. Fourth, for those who don't join airline clubs, more AC outlets and RJ-11 jacks on phones in the public areas.

As for hotels, they've got a long way to go, too. I'm not sure that I like getting tagged an extra \$25 a night for a "business" room. If I'm paying a surcharge, there should be something tangible that I'm paying extra for, such as a computer desk with a work surface that's 26 inches to 28 inches high, and an ergonomic desk chair so that I don't have to pull over an armchair and raise the seating height with two pillows off the bed.

Second, a combination printer/fax machine. One that is functional. With paper. With ink still in the cartridges. With a printer cable. With spares available at the front desk at 11:00 P.M.

Third, a data/fax line that doesn't go through the switchboard. You're likely to have that anyway if there's a printer/fax machine in your room.

These are the only three things that justify an extra fee. And I'd argue that having them should be a competitive feature to get you to use hotel A instead of hotel B. And every room—no matter whether it's deemed a premium "business" room or not—should have a two-line phone so you can call home or check voice mail on Line 1 and simultaneously collect e-mail on Line 2. It goes without saying

that either the phone should have an RJ-11 jack or there should be a wall jack expressly labeled "modem" or "data." From time to time you may find several unlabeled RJ-11s in the room, and you're never sure whether one is a data line, a second jack for the room's only line, an abandoned

line, or a digital line that could fry your modem. Labeling is important because the hotel staff isn't likely to know what kind of jack it is, except maybe the telco guy, and he went home at 5 o'clock.

There ought to be waist-high power outlets near the desk. Actually, I'd like to see a quad outlet that's easily accessible: one outlet for the desk lamp, one for your laptop, one for your cell-phone charger, and one spare.

If any of the desk outlets are switched, there should be a warning label on those outlets. There's nothing more frustrating than pulling into the hotel after a long flight with your battery all but dead and waking up the next morning to find it still all but dead, because when you flipped off the switch by the door just before you went to sleep you also flipped off the outlet your notebook was plugged into.

Many international hotels provide power only when you're in the room: You have to lock the room door from the inside or put your room key in a special switch to complete the circuit. In such cases, the hotel should have one or two dedicated lines that stay live regardless, so you can trickle-charge your notebook when you're away from the room.

One last thing: Every room should have a safe big enough to hold a laptop computer, especially since many hotels are unwilling to store a notebook computer in their safes. And every desk should have an attaching point for a Kensington lock security cable.

Looking ahead, it would be nice to see hotels thinking about higher-speed connections in guest rooms. For ISDN or T1 access from my room, I'd be willing to pay a bit extra.

Some advice for hotels pondering business traveler amenities: Start with the regular rooms, not the executive suites. If your guests can afford a \$500-a-night suite, they probably have someone to do their faxing and printing. **PC**



BETTER BUSINESS
Airlines and hotels have a long way to go before they're business-traveler-friendly.



Fast Connect

This past spring, 56K modems hit the market with a fairly ambitious claim. Vendors promised to deliver devices that could achieve download speeds more akin to those you'll get over ISDN lines for slightly more than the price of a V.34 modem.

To see how close these modems come to the promise of 56 Kbps, PC Labs assembled a group of 19 56K modems from 12 vendors. We subjected the units to our standard modem-testing equipment, recently updated to work with 56K models. Our tests proved that the modems work more or less as advertised, but with three important caveats.

First and foremost: When an upcom-

OBSOLETE ALREADY?

When the wave of 56K fever first ran through the industry last fall, there were three camps—Lucent Technologies, Rockwell International Corp., and U.S. Robotics—each proposing its own, proprietary 56K modem specification. Lucent and Rockwell joined forces to design the K56flex specification. But U.S. Robotics already had a considerable head start and was able to ship its x2 products several months ahead of the competition.

Partly as a result of a merger with 3Com (a supporter of K56flex) earlier this year, U.S. Robotics agreed to work with Lucent and Rockwell on a unified, worldwide 56K modem standard under the ITU, expected to be completed near year's end. Both the

K56flex and x2 camps plan to abandon the current 56K specifications and switch over to this new, unified standard. But there are two problems with this plan.

First, it is not yet known how well existing 56K modems will operate under the ITU standard—or if they will at all. Second, most 56K

Amidst controversy over inflated speed claims (you just can't get 56 Kbps) and confusion over competing standards, 56K modems are here. *By Les Freed*

ing standard is ratified later this year by the International Telecommunications Union (ITU)—a worldwide standards body—all the modems we tested will require a firmware update to that standard. That means you'll want a modem with a guaranteed upgrade path to get you to the forthcoming standard at no additional cost. Second, these modems can indeed achieve speeds approaching 56 Kbps in the download direction, but only under laboratory conditions. Real-world speeds will average between 40 and 50 Kbps. Finally, to achieve download speeds higher than 33.6 Kbps, your phone line must meet certain technical criteria. If it doesn't, there's very little you can do.

modem vendors are promising a free or low-cost firmware update to the new standard when it becomes finalized. Because virtually all 56K modem firmware runs from flash ROM, in theory field updates should be quick and easy. But since the standard hasn't yet been finalized, we can't know for certain that the existing 56K modems will be upgradable to the ITU standard's firmware. For example, the code may require additional storage or higher signal-processing power, either of which could exceed the design limitations of some or all of these products.

All of the vendors with products in this roundup guarantee some sort of free upgrade to the ITU standard—most commonly a software update via flash ROM.

IN THIS REVIEW

Best Data MACH 2 56K Data/Fax Modem.....	105
Boca 56K Internet Modem.....	105
Cardinal Connecta Internal 56K Data/Fax Modem.....	105
Diamond SupraExpress 56e, 56i Sp.....	113
E-Tech Cyber Bullet PC56 RVP.....	113
Global Village TelePort 56 fax/modem.....	113
Hayes Accura 56K Fax Modem.....	114
Logicode Quicktel 56W95-P.....	114
Motorola ModemSurf 56K Data/Fax Modem.....	115
Practical 56K Internal Data/Fax K56flex.....	120
3Com Sportster 56K Faxmodem.....	120
3Com Courier V.Everything.....	120
Zoom/FaxModem 56K, 56Kx.....	120
Editors' Choice.....	104
56K Modems to Go.....	100
Does Your ISP Offer 56K?.....	113

www.pcmag.com

For the interactive version of "Fast Connections for All?", as well as a glossary of 56K modem terms, visit the PC Magazine Web site.

WE'RE GOING
TO CHANGE THE
WAY YOU LOOK
AT DESKTOPS.
(FROM THE
INSIDE OUT.)

The newest Compaq® Deskpro® PC models are proof positive that looks can be deceiving. Sure, they come with the Compaq quality, reliability — and desktop design — we're known for. But just look at how much new technology we've managed to fit inside.

Looking for a powerful Pentium® processor with MMX™ technology? Check out our new Deskpro 2000 and 4000 models. Exciting new graphics? You've got it — from the new S3 Trio 64V2/GX Enhanced 64-bit graphics in the Deskpro 2000 to the phenomenal Matrox Millennium graphics of the Deskpro 6000. Plus bigger hard drives. SDRAM memory, standard. And up to 16X CD-ROMs — with audio — on selected models. It's all inside.

Whichever Deskpro you choose, you'll find it has several additional features that set it apart as a Compaq: Innovation. Affordability. Advanced technology. Ease of use. Plus Intelligent Manageability, standard. So take a closer look at the new Compaq Deskpro today. You'll find there are a lot of exciting new things happening inside that familiar exterior.



Deskpro 2000

Deskpro 4000

Deskpro 6000

DESKPRO	Model 2000	Model 4000	Model 6000
Processor	166MHz Pentium with MMX	200MHz Pentium with MMX	266MHz Pentium II
Standard Memory	16MB DRAM	32MB DRAM	32MB EDO RAM
Hard Drive	2.1GB	3.2GB Ultra ATA	4.2GB SCSI
Standard Cache/Max.	256KB / 512KB	512KB / 512KB	512KB / 512KB
Video Graphics	S3 Trio 64 V2/GX	S3 ViRGE/GX	Matrox MGA Millennium
Video Memory/Max.	1MB / 2MB SGRAM	2MB / 4MB SGRAM	2MB / 8MB WRAM
Diskette Drive	3.5" 1.44MB	3.5" 1.44MB	3.5" 1.44MB
Expansion Slots/Drive Bays	5/5 Desktop	5/4 Desktop	5/4 Desktop
Ports: Serial/Parallel/USB	2/1 ECP/2	2/1 ECP/2	2/1 ECP/0
Intelligent Manageability	Yes	Yes	Yes
CD-ROM	Optional	Optional	8X with Sound
Software Pre-installed	Windows 95	Windows 95	Windows NT for Workstation
Limited Warranty*	3-Year	3-Year	3-Year
Price†	\$1,239	\$1,759	\$3,179
<i>Other Models Available</i>			

COMPAQ

1-800-345-1518

Or Visit Us At www.compaq.com For More Information Or For A Reseller Near You



Monitors and certain options are covered by a One-Year Limited Warranty. *Compaq Deskpros are covered by a Three-Year Limited Warranty. Restrictions and exclusions apply. †All prices shown are estimated street prices, and do not include monitors. Reseller prices may vary. Offer available in the U.S. only. © 1997 Compaq Computer Corporation. All rights reserved. Compaq and the Compaq Logo registered U.S. Patent and Trademark Office. Products, prices and programs are subject to change without notice. Windows and Windows NT are registered trademarks of Microsoft Corporation. Deskpro is a registered trademark. The Intel Inside Logo, Pentium, and MMX technology are registered trademarks and the Pentium Processor Logo is a trademark of Intel Corporation. Other products are trademarks of their respective companies.

Editors' Choice

- K56flex: Diamond SupraExpress 56i Sp
- x2: 3Com Sportster 56K Faxmodem (internal version)



Since the standard your ISP supports may influence your buying decision, we selected an Editors' Choice from each of the product categories, K56flex and x2. There are a number of good choices among the 19 products we tested.

Among the K56flex modems, the Diamond SupraExpress 56i Sp (\$140 street) stood out from a very tough field of competitors. This internal modem presented the best mix of performance, features, and value. The SupraExpress 56i Sp turned in excellent scores across all our tests, most notably on the Impairment tests. The only product we tested that supports V.80 videoconferencing capability, the package includes VDOLive (you'll need to buy the camera) and a host of software—all at a very competitive price.

Among the x2 products, the 3Com Sportster 56K Faxmodem (internal version) turned in very impressive test scores. A generous software bundle (Netscape Navigator 3.0, VocalTec's Internet Phone, PointCast, AOL, CompuServe, Juno e-mail, and FedEx Ship) rounds out

the package (\$200 street).

Several products performed admirably and merit honorable mention. In the x2 category, the 3Com Courier V. Everything external modem (\$270 list) offers features—such as 12 status LEDs, a large speaker, and a sliding volume control—that you won't find on smaller units. A ten-position DIP switch lets you override software settings such as auto-answer and flow control.

Among the K56flex models, five products handed in comparable scores on our tests, and each represents a solid value. They are the Boca 56K Internet Modem (\$140 street), the E-Tech Cyber Bullet PC56 RVP (\$129 direct), the Motorola ModemSurfr 56K Data/Fax Modem (internal version, \$160 street), and the Zoom/FaxModem 56K and Zoom/FaxModem 56Kx (\$120 and \$140 street, respectively).

Five of the vendors also guarantee a hardware update if required (most possibly a chip). Five of the vendors plan to charge either a nominal fee or shipping and handling costs for a hardware-based upgrade. And at the time of this writing, only about half the vendors promise a free modem exchange, if it should be required.

WHAT'S MY LINE

Here's a common scenario: You set up your ISP and install your new modem. The first call you place to your ISP isn't at 53 or even 40 Kbps but a measly 28.8-Kbps or slower connection. What's wrong?

Signals from 56K modems are delicate. They tolerate only one analog-to-digital conversion along your phone line. In most cases, the signal from the line is converted from analog to digital only once, at the phone company's central office, and from there it travels to your ISP, which has a digital connection.

But many phone lines, particularly in

high-population growth areas, are multiplexed together (meaning they share one connection) using a device called a *subscriber line concentrator*, or SLC. If the SLC is able to connect digitally to the phone company's central office, it makes only one conversion. Many older central offices, however, can connect to an SLC line only if the signal is converted to analog form first. Then the central office reconverts the analog phone signal to digital to connect to the digital network. The result of two conversions a signal that's too noisy and distorted to work at 56K. Similarly, 56K will not work through the conversion commonly done in a hotel or business telephone system. So in most cases you can give up the dream of achieving fast connections from the office phone or when you are traveling. Despite this, PC Card 56K modems have also arrived. (To see how three such products rate, refer to the sidebar "56K Modems to Go.")

There's no official estimate of how many phone lines are not 56K-capable. 3Com estimates the figure at only 10 to 15 percent, but our own informal census at *PC Magazine* puts the number between 25 and 40 percent. If you find your phone lines do not support 56K, all the modem manufacturers in this roundup will accept a return.

Fortunately, you can determine whether your existing phone line is 56K-capable before you buy. 3Com offers a test number to call using any V.34 modem. (For instructions, go to x2.usr.com/linetest1.html.) 3Com's computer will analyze your line, and if it deems the line x2-capable, you can use either an x2 or a K56flex modem. If you have more than one line, try them all. We've seen instances where one line in a home or office won't work, but another one will.

In most cases, whether you choose a K56flex or x2 modem will depend on which standard your ISP has implemented. If your provider uses Ascend or Cisco equipment, you'll need a K56flex modem, but if your ISP uses USR Total Control modem banks, you'll need an x2. Nationwide online services such as AOL and CompuServe are conducting field trials of

Our Contributors: LES FREED and M. DAVID STONE are contributing editors at *PC Magazine*. TED NEEDLEMAN is a frequent contributor to *PC Magazine*. TONI F. KISTNER is the associate editor for networking and communications. LEON ERLANGER was the senior editor in charge of this story, and JEFFREY G. WITT was the project leader.

both modem types, but neither has rolled out 56K on a nationwide basis. (To see how some of the bigger ISPs are rolling out 56K, see "Does Your ISP Offer 56K?")

THE REAL SPEED

Our testing favored the K56flex products, but not dramatically. On a clean phone line and using noncompressible files such as programs, K56flex modems eked out a 5 percent performance advantage over x2 modems. That edge widened to anywhere from 7 to 10 percent on noisier lines. We found the x2 modems more susceptible to line degradation. By contrast, many of the x2 products transferred moderately compressed files, such as word processing documents, as many as 1,000 to 2,000 characters per second (cps) faster than the K56flex files, at about a 10 percent edge.

Top performers were Diamond's SupraExpress 56i Sp, our Editors' Choice in the K56flex category, and the internal version of 3Com's Sportster 56K Faxmodem, which garnered Editors' Choice among x2 products.

Although many of the modems delivered an average speed of 50 Kbps in our testing, real-world speeds are likely to be significantly slower. On informal tests we conducted using standard phone lines in California, New York, and Florida, results varied widely but averaged between 40 and 52 Kbps. In addition, consecutive calls to the same number using the same modem often produced widely differing connection speeds.

Editors' Note: As we went to press, an issue of intellectual property rights threatened to delay development of the new ITU standard, and this may slip the finalization of the standard into mid-1998.

Best Data MACH 2 56K Data/Fax Modem

Best Data Products MACH 2 56K Data/Fax Modem (\$150 street) offers little to recommend it. Sluggish speeds placed the internal x2 unit near or at the bottom of the pack on all our tests.

The package is sparse. Documentation is minimal, consisting of a combination installation and AT-command guide and a troubleshooting booklet. Bundled software consists of Smith Micro's QuickLink II and some demoware.

Setup was troublesome. Though the MACH 2's Windows 95 drivers installed automatically, the modem driver crashed on one of our three test machines—but only when connecting in x2 mode. Reinstalling the driver cleared up the problem, although we're at a loss to explain why.

Best Data Products guarantees a free software upgrade to the ITU standard. In the event of a hardware upgrade, the company will provide it at nominal cost. —Les Freed

MACH 2 56K Data/Fax Modem. Street price: \$150. Best Data Products Inc., Chatsworth, CA; 818-773-9600; www.bestdata.com. Circle 490 on reader service card.

Boca 56K Internet Modem

Above-average performance and a low price (\$140 street) make the Boca 56K Internet Modem one of the better values in this roundup.

The K56flex-compatible internal unit was easy to install, in part thanks to an excellent quick-start guide with separate sections for Windows 95 and Windows 3.x users. Plug and Play allowed for a perfect installation in both test units. Users with older systems will appreciate the availability of IRQ and port assignment jumpers.

A rich software bundle well suited to the home office complements the package, and includes Netscape Navigator and Qualcomm's Eudora e-mail. A well-organized menu system lets you install programs selectively from the CD-ROM.

The 56K Internet Modem uses a flash ROM. If the update to the ITU standard will be accomplished through software, Boca is the upgrade available from its Web site. If new hardware is needed, Boca plans to pass shipping and handling costs to the users. —LF

Boca 56K Internet Modem. Street price: \$140. Boca Research Inc., Boca Raton, FL; 561-997-6227; www.bocaresearch.com. Circle 491 on reader service card.

Cardinal Connecta Internal 56K Data/Fax Modem

Cardinal Technologies' Connecta Internal 56K Data Fax Modem (\$150 street) is essentially identical to the internal version of 3Com Corp.'s Sportster 56K Faxmodem, an Editors' Choice. Performance for both of these x2 products was quite good,

How 56K Modems Work

In order to achieve downloading speeds of 33.6 to 56 Kbps with your 56K modem, there can be only one analog-to-digital conversion between your location and your ISP. The ISP has a direct digital connection to the telephone network.





Raw ideas. Refined.

Introducing the PaperPort Strobe color scanner.

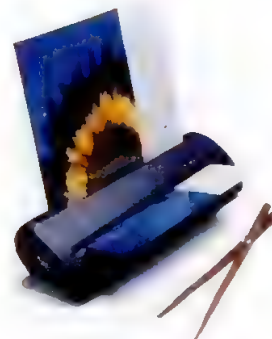
Wild. Raw. Even half-baked. Whatever you call your ideas in the beginning, no doubt they'll need to be polished, shared, and filed for future use. The PaperPort Strobe color scanner is a revolutionary new tool that can give your ideas the power they need to swim upstream. PaperPort Strobe sets a new standard for ease of use: Hook it up in minutes. Feed in any color or black-and-white document (up to 30" long). And in as few as 4 seconds, you're ready to go. Photos, reports, charts, clippings, even receipts—PaperPort scans them without you having to touch a button. Then just drag and drop the image into one of your favorite applications—PaperPort works with more than 150 apps. Its award-winning

software makes your life much easier: Avoid retyping by using built-in OCR software. Fax super-clear documents using its exclusive SharpPage™ technology. Make copies of charts. Enhance photos with our simple-to-use image-editing tool AutoFix™. Send them to a friend or colleague via the Internet—or publish them on a Web site. And to find yesterday's great idea, you're only a click away from retrieving it—just type in a single key word. What's more, thanks to new MicroChrome™ color technology, PaperPort Strobe delivers flatbed-quality color scanning in a minnow-size sheetfed design that won't eat up desk space—it measures just 2" by 2.5" by 11". PaperPort Strobe. It's powerful. It's brilliant. It cooks.



Microchrome Technology

Call 1-800-787-7007, extension 211 or contact an authorized reseller.
Visit our web site at www.visioneer.com
Windows and Macintosh versions available.



PAPERPORT Strobe
The easiest way to build a colorful image.

PaperPort Strobe is available through these resale partners: America Online, Best Buy, ClubMac, CompUSA, Computer City, Computer Discount Warehouse, Creative Computers, MacMall, MacWarehouse, MacZone, Micro Center, Nobody Beats the Wiz, PC Connection, and Staples.

Copyright © 1997 Visioneer, Inc. All rights reserved. AutoFax, MicroChrome, SharpPage, and Visioneer are trademarks of Visioneer, Inc. The Visioneer logo and PaperPort are registered trademarks. All trademarks are the property of their respective owners. VS6074.5/97

 **visioneer**

56K Modems to Go

Business travelers are always receptive to and willing to shell out money for the latest PC Card peripheral that promises to make their road computing faster and easier. For this reason, modem vendors were quick to offer new 56K technology in PC Card modems.

Just like their desktop equivalents, mobile modem vendors are split into K56flex- and x2-capable camps. And as with the desktop modems we tested in the main story, nearly all the vendors promise free software upgrades to the ITU standard.

YOU CAN'T GET THERE FROM HERE

Don't let the availability of shipping products fool you: 56K technology is ill suited to almost all business travelers. Why? 56K modems require only a single analog-to-digital conversion, which means they often won't work through a PBX or on digital telephone systems. That scratches the majority of hotel rooms and branch offices.

We tested three 56K PC card units: two K56flex products, from Hayes and Viking, and an x2 product, from 3Com. Each package included the standard drivers, various software, and optional cables for use with selected cellular phones. For testing, we used a 166-MHz Pentium MMX Transmonde Vibrant laptop. We disabled the Vibrant's built-in modem, then connected each modem over a standard dedicated home telephone line, located about 21,000 feet from the telephone company's switching office. We made calls to AOL's K56flex and x2 test number in New York, about 45 miles away.

Set up for each of the three



These 56K modems are fast but often won't deliver high speeds from hotel rooms or your branch office.

modems was vintage Plug and Play: Windows 95 instantly recognized each PC Card on insertion into the slot. We loaded the drivers off the floppy disk and had each up and running within minutes.

K56FLEX CONTENDERS

Hayes' K56flex-capable **Accura 56K PC Card** (\$210 street) attaches to the phone line via a short hanging cable, or dongle. Included is Smartcom LE, a communications software package with file-transfer, fax, and voice mail functions. Documentation consists of a detailed booklet.

The Accura connected consistently to our local AOL phone number at 28.8 Kbps, and to our test number at an average of 38 Kbps—the slowest speeds we encountered. Note, however, that these devices are highly sensitive to line conditions. Further testing might have yielded more favorable

results. (Hayes Microcomputer Products Inc., Atlanta; 770-840-9200; www.hayes.com. *Circle 502 on reader service card.*)

The K56flex-based **Viking FM56KP PC Card** (\$220 street) attaches to the phone line via a standard dongle. Documentation consists of a thin yet thorough pamphlet.

The Viking card includes Smith Micro Software's QuickLink Mobile, which provides fax and file-transfer capabilities. We connected easily and consistently to AOL's test number at 44 Kbps, on the average. (Viking Components, Rancho Santa Margarita, CA; 800-338-2361; www.vikingcomponents.com. *Circle 503 on reader service card.*)

3COM'S OFFERING

3Com's **Megahertz XJ5560 PC Card** (\$270 street) comes in a Megahertz box; the card wears a U.S. Robotics logo, and the company is now called 3Com.

The x2-capable Megahertz features an XJack. This handy RJ-11 jack pops out from the side of the card; just plug it into a standard modular cord—no extra dongles to lose or leave back at the hotel. Installation was trouble-free but a bit irregular: You install the software first, then insert the card when prompted. Documentation consists of a small installation card and online manuals.

The Megahertz includes 3Com's robust RapidComm software, which features both speakerphone and voice mail capabilities. We experienced top-speed 49.3 Kbps connection to our test number, on the average. (3Com Corp., Santa Clara, CA; 800-527-8677; www.usr.com/mobileusr. *Circle 504 on reader service card.*)—*Ted Needleman*

though the Connecta 56K scored a bit lower on our Impairment tests. The Connecta 56K is priced at \$50 less than the Sportster, but the Sportster's software bundle is extremely generous.

The Plug and Play installation was easy. Cardinal includes IRQ and port selection jumpers you can use to install the modem in

older systems. Software includes Eudora Lite, FaxTalk Plus, Windows 95, and Windows 3.x drivers and trial versions of Starfish Software's Internet Utilities, Sidekick 97, ViruCide, and Microtest's WebEtc. Oddly absent is a Web browser.

Cardinal offers a trade-up program for users of its older units (\$89 for 28.8

Kbps, \$109 for 33.6 Kbps), and it plans to provide a free, unconditional upgrade to the upcoming ITU standard.—*LF*
Connecta Internal 56K Data/Fax Modem. Street price: \$150. Cardinal Technologies Inc., Atlanta; 770-840-2157; www.cardtech.com. *Circle 492 on reader service card.*



Still trying to decide
when to buy
a 56K modem?

Let us make it easy for you.
Now get

\$50

cash back.



\$50 (US) rebate offer replaces previous free month of ISP service (up to \$25 US) for U.S. Robotics desktop modems only. Original free month of ISP service offer still applies to Megahertz® 56K PC Card modems, models XJ1560, CC1560, XJ5560 and CC5560.

1. All x2 products are capable of 56 Kbps downloads, however due to FCC rules which restrict power output of service providers modems, current download speeds are limited to 53 Kbps. Actual speeds may vary depending on line conditions.

Uploads from users to providers faster at speeds up to 28.8 Kbps.

2. An x2-capable modem, an x2-compatible analog phone line and an x2-capable service provider are required for these high speed downloads. See www.us.com/x2 for details.

3. Guaranteed upgrade valid for all currently available Sportster 56k faxmodems (Models 1783, 1784, 1785, 1786, 1787 and 1789), Courier 56K faxmodems (Models 1867, 1868 and 1869) and Megahertz PC Card modems (Models XJ1560, CC1560, XJ5560, and CC5560).

This offer valid in the U.S. and Canada only; upgrades must be claimed by 9/30/98.

©1997 3Com Corporation. All rights reserved. 3Com, the 3Com logo, U.S. Robotics, the U.S. Robotics logo, Megahertz and Sportster are registered trademarks and Courier x2 and the x2 logo are trademarks of 3Com Corporation or its subsidiaries. All other company and product names are used for identification purposes only and may be trademarks and/or registered trademarks of their respective companies. Product specifications subject to change without notice. B197 #3021

x2™ Delivers...even more.

x2 Delivers...cash back and more

Every day, more and more information is added to the Internet. Like bigger data files, and richer graphics. You're going to need a faster modem than the 28.8K and 33.6K models out there now.

That's why we're making it easier for you to get the x2 technology 56K¹ modem, the fastest ever created for use with regular phone lines – by giving you \$50 (US) cash back.

x2 Delivers...high download speeds now

You don't need to wait to take advantage of this modem's superior download speeds. That's because x2 technology has already received the support of more than 800 Internet service providers (ISPs), from industry giants like IBM Global Services, America Online, Prodigy and NETCOM to smaller regional providers. In fact, more than 700 of them are live today, offering local access. That means you can start downloading at high speeds in all 50 states right now with x2.¹ It's that simple.

x2 Delivers...free upgrade to standard

You may have heard that the international 56K modem standard hasn't yet been defined (expected in 1998). That's why we're offering a no-risk guarantee of a free upgrade to make your x2 modem meet this new standard after it's approved. And since x2 uses DSP Solutions technology from Texas Instruments, it can easily be software upgraded to receive future performance enhancements as they're developed.

x2 Delivers...guaranteed

To make it easier for you to experience x2 technology now, we're introducing "x2 Delivers More," a special program that will show you why buying an x2 modem now makes so much sense.



\$50 (US) CASH BACK

Now, instead of a free month of Internet service, we're offering a \$50 (US) mail-in rebate when you purchase a U.S. Robotics x2 technology 56K desktop modem by 10/4/97. It's a great way to help you get even more out of the Internet.

CONNECT NOW in all 50 states and Canada

Right now, more than 700 ISPs are live with x2, so you can connect regardless of where you live.¹

FREE UPGRADE to standard¹

After the new 56K ITU-T standard is approved, we'll upgrade your U.S. Robotics x2 technology 56K modem to meet it – absolutely free.

30-DAY money-back guarantee

We're confident you'll be completely satisfied with your new x2 modem. If not, you can return it with your dated receipt within 30 days of purchase – no questions asked.

See the back cover for complete details of the x2 Delivers More program.

x2 Delivers...an easy choice

The ability to connect now in all 50 states and Canada. \$50 (US) cash back. A free upgrade to standard. A 30-day money-back guarantee. It simply couldn't be any easier. For more information, visit our Web site at <http://x2.usr.com/connectnow>, or call 1-800-525-USR1 to find an ISP near you that offers live x2 service.

Now download at high speeds with the company that connects more people to the Internet than any other. To get the speed you need, just remember one thing: x2 delivers even more than before.

U.S. Robotics®





**\$50 (US) CASH BACK WHEN YOU BUY x2 TECHNOLOGY NOW.
CONNECT NOW WITH MORE THAN 700 LIVE ISPs NATIONWIDE.
FREE UPGRADE TO 56K ITU-T STANDARD.
30-DAY MONEY-BACK GUARANTEE.**

Buy any Sportster™ or Courier™ 56K modem with x2™ technology between July 1 and October 4, 1997 and get \$50 (US) cash back plus upgrade to 56K ITU-T standard, FREE. And if you're not satisfied after 30 days you can return the modem for a full refund.

To get your \$50 (US) cash back, please follow these steps:

1. One week after purchase of the first modem, place the \$50 (US) cash back in the envelope provided with the modem. The envelope will contain the 56K modem upgrade code and a copy of the x2 Delivers More! program. The cash back envelope will be placed in the modem package. The cash back envelope will be placed in the modem package. The cash back envelope will be placed in the modem package. The cash back envelope will be placed in the modem package.

2. Enclose this completed form with a copy of your dated modem receipt, original UPC bar code symbol and serial number from the modem package (see samples below) and mail to:

U.S. Robotics, x2 Delivers More, PO Box 8131, Young America, MN 55551-8131

Any questions regarding this program please call 1-888-390-6863. This offer supersedes all other preceding x2 offers for Sportster and Courier desktop modems. Internet service offer, up to \$25 (US), still applies to Megahertz 56K PC Card modems.

U.S. Robotics
x2
TECHNOLOGY
\$50
Cash Back
TO HELP ENHANCE YOUR INTERNET EXPERIENCE

Get \$50 (US) cash back from U.S. Robotics

To get your \$50 (US) cash back:

1. Buy any Sportster or Courier modem listed below between July 1 and October 4, 1997.
2. Fill in all requested information on this form.
3. Enclose this completed form with a copy of your dated modem receipt, original UPC bar code symbol and serial number from the modem package (see samples below) and mail to:

U.S. Robotics, x2 Delivers More, PO Box 8131, Young America, MN 55551-8131

Any questions regarding this program please call 1-888-390-6863.

This offer supersedes all other preceding x2 offers for Sportster and Courier desktop modems. Internet service offer, up to \$25 (US), still applies to Megahertz 56K PC Card modems.

(Please print all information clearly.)

Name _____

Address _____

City _____

State/Prov _____

ZIP/Post _____

Phone _____

E-mail Address _____

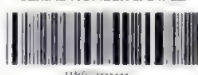
Retailer / Mail Order Reseller where modem purchased _____

\$50 (US) cash back offer valid with purchase of Sportster 56K Faxmodem models 1787, 1784, 1785, 1786, 1787 and 1789 and Courier 56K Faxmodem models 1857, 1858 and 1859 only, purchased between July 1 and October 4, 1997. \$50 (US) cash back will be provided with the upgrade to 56K ITU-T standard. Request must include original UPC bar code symbol and serial number from the modem package. Cash back envelope must be placed in the modem package. Request must be postmarked by November 15, 1997. Valid in US and Canada only. Not valid with any other offer. Please allow 5 to 8 weeks for receipt of check.

UPC SAMPLE



SERIAL NUMBER SAMPLE



The following UPC codes are the only acceptable codes for this offer. No other UPC codes are valid. Tape UPC bar code over this box.

7-38168-00611-3	7-38168-00612-0	7-38168-00613-7	7-38168-00614-4
7-38168-00615-1	7-38168-00616-8	7-38168-00619-4	7-38168-00629-8
7-38168-00682-3	7-38168-00689-1	7-38168-00669-4	7-38168-00670-0
7-38168-00687-8			

Tape serial number & bar code over this box.

Does Your ISP Offer 56K?

Here's how some nationwide ISPs fall in.

■ YES ■ NO ■ IN TRIAL	K56flex	x2	Extra charge	Availability	Web site	To order service
	■	■	None ¹	Selected U.S. cities (Anaheim, CA; Annapolis, MD; Atlanta, Boston, Chicago, Fredericksburg, VA; Houston; Los Angeles, New York; Oakland, CA; Philadelphia, Phoenix; Pittsburgh, San Diego; Skokie, IL, Washington)	www.aol.com	800-837-6364
	■	■	None	Southern California (Anaheim, Los Angeles, Palmdale, Pasadena, Riverside, Thousand Oaks)	www.earthlink.net	800-395-8425
	■	■	None	North America	www.ibm.net	800-821-4612
	■	■	None	Selected U.S. cities (Chicago, Dallas, Los Angeles, New York, San Francisco, Seattle, Washington)	www.msn.com	800-373-3676
	■	■	None	36 southeastern locations	www.mindspring.com	800-719-4660
	■	■	\$5 or \$10 per month ²	Selected U.S. cities (Atlanta, Boston, Chicago, Dallas, Los Angeles, New York, San Francisco/San Jose, Seattle, Washington)	www.netcom.com	800-638-2661
	■	■	None ¹	Selected U.S. cities (Atlanta, Boston, Clearwater, FL, Dallas, Houston, Los Angeles, New York, Raleigh-Durham, NC, White Plains, NY)	www.prodigy.com	800-776-3449

(1) \$6 hourly charge outside of specified locations (2) For Basic Service customers, \$10; for Advantage Service customers, \$5 (3) K56flex support is planned for 20 cities by the end of 1997

Diamond SupraExpress 56e, 56i Sp



Diamond Multimedia Systems' external SupraExpress 56e and internal SupraExpress 56i Sp (\$140 each, street) combine excellent K56flex performance and videoconferencing capability with a large, well-conceived software bundle. The SupraExpress 56i Sp merits our Editors' Choice.

The SupraExpress 56e's black plastic case is compact—about the size of a thin paperback book—and is adorned by four LEDs. Because there's no room for an RS-232 connector, a 25-pin serial cable is permanently attached. The SupraExpress 56e lacks a power switch and hardware volume control, as well as rubber feet, so it tends to slide around on the desktop.

The SupraExpress 56i Sp provides IRQ and address jumpers for use in older machines. Included is a small microphone and a full-duplex speakerphone with a

patch cable to connect it to a line-in jack.

Both modems include VDOLive videoconferencing software and a host of other programs. Subscribers to Diamond's BackWeb channel will automatically receive a free firmware update to the ITU standard. Diamond also guarantees a free hardware upgrade if necessary, exclusive of shipping and handling costs.—*LF*

SupraExpress 56e, SupraExpress 56i Sp. Street price: \$140 each. Diamond Multimedia Systems Inc., San Jose, CA; 360-604-1400; www.diamondmm.com. *Circle 493 on reader service card.*

E-Tech Cyber Bullet PC56 RVP

A generic K56flex internal modem, E-Tech Research's Cyber Bullet PC56 RVP (\$129.99 direct) lacks even a disk label bearing E-Tech's name. But its quality design makes it one of the best values for users willing to forgo a lot of software.

Installation is a standard Plug and Play process, though you can set the board via jumpers too; the manual provides a complete list of modem commands. Software includes SuperVoice for fax and voice mail.

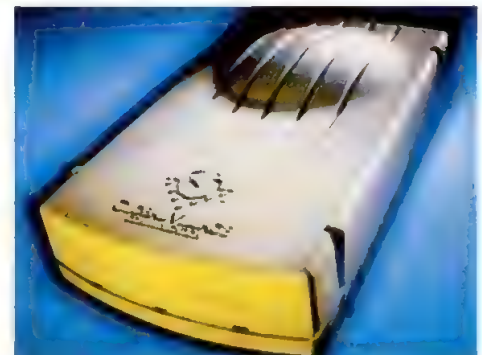
Among the K56flex products we tested, the Cyber Bullet was one of the better performers with scores in the top tier (with the exception of one Impairment test).

E-Tech is planning to provide a free upgrade to the ITU standard, whether through software or hardware. For only \$39, E-Tech customers with 33.6-Kbps modems can trade up to the Cyber Bullet.—*M. David Stone*

Cyber Bullet PC56 RVP. Direct price: \$129.99. E-Tech Research Inc., Fremont, CA; 888-609-8885, 510-438-6700; www.e-tech.com. *Circle 494 on reader service card.*

Global Village TelePort 56 fax/modem

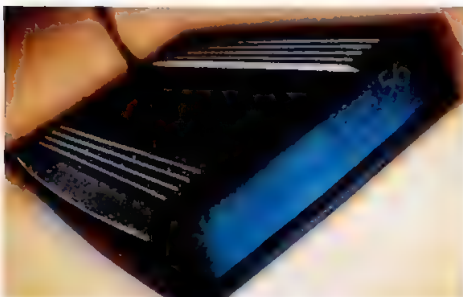
A longtime leader in the Macintosh modem market, Global Village debuts on the PC modem scene with an x2-compatible unit, the TelePort 56 fax/modem (internal version, \$149 list; external version, \$159). Although the external modem per-



The smallest external modem we tested, the TelePort's design includes a permanently attached 9-pin serial cable.

formed well, the internal unit stumbled on one of our tests.

Because the internal TelePort is identical in appearance to the internal 3Com Sportster 56K Faxmodem, we expected identical performance. But the TelePort scored substantially below the Sportster on our Impairment tests. This is probably due to subtle firmware differences.



The SupraExpress 56e has a compact design but lacks rubber feet, making it prone to sliding around the desktop.

The external TelePort is the smallest external modem we tested. It is slightly larger than a mouse, with three LED indicators on the front panel. As with the Diamond SupraExpress 56e, a permanently attached 9-pin serial cable is provided. There's no external volume control, and the built-in speaker is quite loud.

Both versions include Global Village's FaxWorks software, AOL 3.0, a detailed reference manual in Adobe Acrobat format, and Acrobat Reader. The company has promised to provide users with a free software update to the ITU standard, available from its Web site. A hardware solution, if necessary, will be free, exclusive of shipping and handling charges.—*LF*

TelePort 56 fax/modem. List price: Internal version, \$149; external version, \$169. Global Village Communication, Sunnyvale, CA; 408-523-1000; www.globalvillage.com. Circle 495 on reader service card.

Hayes Accura 56K Fax Modem

When you think of modems, Hayes always comes to mind. The Accura 56K Fax Modem (internal version, \$150 street; external version, \$180) is a fair performer in a market that in recent years has been dominated by bigger names.

Plug and Play installation for both the internal and external versions of this K56flex unit was uneventful. You can also set the modem through jumpers or software, but the manual lacks a list of modem commands. (Hayes plans to remedy this.) Software includes Smartcom Message Center LE (limited edition) for fax and data. The internal version was an average performer overall.

The external version's design is standard, with eight status lights. Installation was normal. Because the external version that we tested used older firmware

SUMMARY OF FEATURES

56K Modems

PC MAGAZINE
EDITOR'S CHOICE

	Best Data MACH 2 56K Data/Fax Modem	Boca 56K Internet Modem	Cardinal Connecta 56K Data/Fax Modem	Diamond SupraExpress 56e and 56i Sp ¹
Price (External)	N/A	N/A	N/A	\$140 (street)
Price (Internal)	\$150 (street)	\$112 (list) ²	\$150 (street)	\$140 (street)
Standard supported	x2	K56flex	x2	K56flex
Chip set manufacturer	Texas Instruments	Rockwell	Texas Instruments	Rockwell
Minimum system requirements	386 CPU, CD-ROM, 8MB RAM	486 CPU, 8MB RAM, 2X CD-ROM	486DX CPU, 4MB RAM	386 CPU, AT bus, 8 MB RAM
OS support	Win 3.x, Win 95	Win 3.1, Win 95, DOS	Win 3.x, Win 95, Win NT, DOS	Win 3.x, Win 95
External dimensions (HWD)	N/A	N/A	N/A	1.2 x 4.1 x 6.7
Number of LEDs (external model)	N/A	N/A	N/A	4
Slot size (internal model)	8-bit ISA	16-bit ISA	8-bit ISA	16-bit ISA
Protocols supported:				
ITU V.42bis/MNP 5/V.80	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Features				
Data/fax	■ ■	■ ■	■ ■	■ ■
Voice/speakerphone	■ ■	■ ■	■ ■	■ ■
Caller ID	■	■	■	■
Distinctive ring	■	■	■	■
Error control	■	■	■	■
Connection guarantee	■	■	■	■
Carrier loss redial	■	■	■	■
Automatic rate adaptation	■	■	■	■
Automatic fax or data detection	■	■	■	■
Full duplex	■	■	■	■
Backward-compatible	■	■	■	■
Upgrade Method to ITU Standard				
Exchange	■	■	■	■
Software upgrade	■	■	■	■
Flash ROM upgrade	■	■	■	■
Service and Support				
Warranty	5 years	5 years	5 years	5 years
Technical-support number	818-773-9800	561-241-8088	770-940-2157	541-967-2450
Technical-support hours (eastern time)	11:00-7:30 M-F	8:00-6:30, 7 days	8:00-8:00 M-F	8:00 A.M.-10:00 P.M. M-F
Web address	www.bestdata.com	www.bocaresearch.com	www.cardtech.com	www.diamondmm.com

(1) The Editors' Choice is awarded to the internal version only. (2) A \$10 rebate is available through 12/31/97. (3) The Logicode Quicktel 56W95-P is Win 3.x.

(V0.110), its performance suffered in comparison with that of the internal version, which used the latest firmware (V0.519). Performance for both units fell slightly below average overall. More important, the older firmware isn't flash-upgradable. The flash-upgradable version is V0.519; conversely, avoid V0.110 and V0.520.

Hayes plans to provide both free software and hardware upgrades to the upcoming ITU standard. At the time of this writing, Hayes did not offer an upgrade plan for its existing V.34 modem customers.—*MDS*

Accura 56K Fax Modem. Street price: Inter-

nal version, \$150; external version, \$180. Hayes Microcomputer Products Inc., Atlanta; 770-441-1617; www.hayes.com. Circle 496 on reader service card.

Logicode Quicktel 56W95-P

Unlike most modems, which perform processing using an on-board controller, Logicode's Quicktel 56W95-P (\$130 street) performs some processing using the computer's CPU. Although this design contributes to the low price, the result can mean slow performance.

This x2 modem's installation was textbook Plug and Play; you can also change



To ensure you buy an Accura with the latest firmware, check the version number on the box's bar code.

Zoom/FaxModem 56K and 56Kx
\$140 (street)

OCTOBER 21, 1997 PC MAGAZINE 115



Lights. Camera. Computer!

Introducing Intel PC Imaging technology.

The personal computer is seeing a lot of action in digital imaging these days. That's because the PC is now being used to capture, edit, store, communicate, and share still and video images.



film for capturing and downloading digital images. The miniature card's size and convenient package makes it easy to use in cameras and PCs.



It's a whole new area called PC Imaging. And Intel's advancements in PC technology have created numerous possibilities within it.

For one, PCs truly have the power required. The Pentium® processor with MMX™ technology and the new Pentium® II processor give you smoother video, faster graphics, fuller sound and richer color.*

Intel Flash memory miniature cards provide rugged, reusable electronic

And Intel's work to advance the Universal Serial Bus (USB) provides plug-and-play connections and quicker transfer rates for digital cameras. We are simplifying connectivity and interoperability by developing industry design guidelines for a new class of digital cameras. We also support the FlashPix¹ file format standard to simplify image use across the Internet and software applications.

But this is merely a snapshot of what Intel has to offer. Get the whole



picture about PC Imaging

technologies and find out what to look for in a digital camera at our Web site.

► www.intel.com/response/pcimaging2

© 1997 Intel Corporation. *As compared to a Pentium® processor without MMX™ technology at same speed measured on Intel's Media Benchmark. †Third-party trademarks are the property of their respective holders.

intel.

The Computer Inside.™

PERFORMANCE TESTS

56K Modems



For the most part, the new breed of 56K modems deliver high-speed performance for Internet downloads. We found the

K56flex-based products navigated harsh phone line conditions better, while the x2 modems transferred compressed files faster.

What the Numbers Mean

For our **Noncompressible File Transfer** tests, we used clean, simulated lines to transfer data similar to what you'd typically download from a Web or FTP site. Nearly all the products delivered throughput of 50 Kbps (kilobits per second) or better. The modems achieved a 40 percent performance gain or better over our baseline V.34 modem. However, such speeds can also be attributed to our pristine testing conditions. Real-world performance is likely to be substantially slower, averaging about 40 to 50 Kbps.

The leaders were the E-Tech Cyber Bullet PC56 RVP and the Motorola ModemSurfr 56K Data/Fax modem, both internal K56flex modems. The K56flex chip sets offered a 5 percent performance edge over the best-performing x2-based internal modems, the Cardinal, Global Village, and internal 3Com Sportster units.

The slower, 43-Kbps scores handed in by two x2 modems—the Best Data MACH 2 56K Data/Fax Modem and Logicode Quicktel 56W95-P—were the result of a software-based designs that rely heavily on the desktop PC's processor. When we ran additional tests using a more powerful Pentium/133 system, as opposed to our test-bed 486DX66, the Best Data and Logicode modems' performance sped up considerably, putting their scores more on a par with those of the hardware-based x2 modems.

The poor performance turned in by the Hayes Accura 56K Modem (internal) and the Practical 56K Internal Data/Fax K56flex internal modem was the result of older, nonflashable firmware that caused those modems' performance to fall back almost to V.34 speeds. But by the time you read this, both products should have implemented the latest firmware revision. This code was already used on the external Hayes Accura 56K Modem that we tested, so it's safe to expect the internal Accura 56K and the Practical 56K available now to perform comparably.

Our **Moderately Compressible File Transfer** test illustrates the vendors' V.42bis compression implementation during a word processing file download. The results confirmed that x2 products transfer compressed files faster than K56flex models. The Global

Bold type denotes first place within each category.
Characters per second (1,000 cps = 7.8 Kbps)

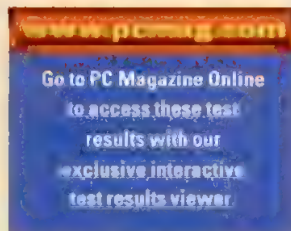
	Noncompressible File Transfer	Moderately Compressible File Transfer	Network Model Coverage
X2 MODEMS			
Best Data MACH 2 56K Data/Fax Modem	4,300	7,740	5,190
Cardinal Connecta Internal 56K Data/Fax Modem	5,270	10,700	5,867
Global Village TelePort 56 fax/modem (internal)	5,260	10,800	5,928
Global Village TelePort 56 fax/modem (external)	5,130	10,400	6,368
Logicode Quicktel 56W95-P	4,220	8,640	3,841
3Com Sportster 56K Faxmodem (internal)	5,260	10,800	5,951
3Com Sportster 56K Faxmodem (external)	4,840	9,720	6,013
3Com Courier V. Everything	5,060	10,700	7,816
V.34 modem*	3,764	7,472	
K56FLEX MODEMS			
Boca 56K Internet Modem	4,765	9,781	8,205
Diamond SupraExpress 56e	5,423	9,236	8,022
Diamond SupraExpress 56i Sp	5,425	9,186	7,497
E-Tech Cyber Bullet PC56 RVP	5,436	9,194	8,467
Hayes Accura 56K Fax Modem (internal)	3,509	9,138	8,305
Hayes Accura 56K Fax Modem (external)	5,423	8,463	7,130
Motorola ModemSurfr 56K Data/Fax Modem (internal)	5,436	9,179	8,242
Motorola ModemSurfr 56K Data/Fax Modem (external)	5,412	9,122	7,304
Practical 56K Internal Data/Fax K56flex	3,515	8,403	7,489
Zoom/FaxModem 56K	5,425	9,192	8,008
Zoom/FaxModem 56Kx	5,423	9,138	7,703
V.34 modem*	3,764	7,472	
* U.S. Robotics Courier 33.6 External, reported for comparison (File Transfer tests only)			
	BETTER ►	BETTER ►	BETTER ►

Village TelePort 56 fax/modem and 3Com Sportster 56K Faxmodem (internal models) demonstrated nearly a 15 percent performance edge over the K56flex competition.

To simulate adverse conditions you might face in using the public switched telephone network (PSTN)—where a given call is subject to the circumstances of the phone circuit—we transferred data across the lines with a variety of impairments. They include *line echo*, which occurs when transmit and receive signals are reflected back in the opposite direction; *intermodulation distortion*, which occurs when the telephone line doesn't transmit data linearly; *bit robbing*, which occurs when the equipment uses part of the user bandwidth for its own signaling needs; and *trunk line signal loss*, which shows the effect of digital signal attenuators in the telephone company's equipment.

The **Network Model Coverage** test reflects the average throughput each modem produces across all lines. The K56flex products—notably the E-Tech Cyber Bullet PC56 RVP, the Hayes Accura 56K, and the Motorola ModemSurfr 56K Data/Fax internal modems—clearly outpaced the x2 models, with the exception of the 3Com Courier V. Everything. On the average, the K56flex products generated 1,000 to 2,000 additional characters per second.

Our **Impairment** tests illustrate which line impairments specific to digital transfers stress each of the products most. The results reflected fairly consistent performance for all products across both chip-set families.—*Analysis written by Jeffrey G. Witt*



How We Tested

At PC Magazine Labs, we used two digital remote-access servers: the U.S. Robotics Total Control for x2 modems and the Cisco AS5200 digital remote-access server for the K56flex products. We connected these servers to a Telecom Analysis System (TAS) 240 local-loop emulator and TAS Series II central-site simulator with 56K testing capabilities. An emulated telephone line provided the connection between the TAS 240 and the Series II, while a channelized T1 line provided the connection between the Series II and the digital servers. We based our test script on the first phase of the draft test specifications currently being discussed in the major telephony standards bodies.

For the **Noncompressible** and **Moderately Compressible File-Transfer** tests, we used an emulated phone line containing virtually no impairment levels. For each test, we transferred the files from the digital server to the client modems and measured the throughput in cps.

The **Network Model Coverage** test measured throughput over 18 different line-impairment combinations representing connection conditions that a user is most likely to encounter. To simulate the impairments, we connected the TAS 240 and Series II devices to a Dell Dimension XPS—a Pentium/133 system. The TASKit 6.21 testing software inserted the proposed line impairments as we transferred a moderately compressible text file from the digital server to the client modems. We set the modems to use a DTE (data terminal equipment) rate of 115,200 Kbps.

The **Impairment** tests simulated specific line impairments: line echo, robbed bits, intermodulation distortion, and trunk-line signal loss.—*Andrew Go*

Bold type denotes first place within each category.

Characters per second (1,000 cps = 7.8 Kbps)	Impairment			
	Line Echo	Intermodular Distortion	Robbed Bits	Trunk Line Signal Loss
X2 MODEMS				
Best Data MACH 2 56K Data/Fax Modem	N/A	5,455	7,375	387
Cardinal Connecta Internal 56K Data/Fax Modem	10,100	9,845	10,350	5,525
Global Village TelePort 56 fax/modem (internal)	2,320	5,595	4,440	3,385
Global Village TelePort 56 fax/modem (external)	10,400	9,300	4,985	5,115
Logicode Quicktel 56W95-P	7,570	N/A	N/A	N/A
3Com Sportster 56K Faxmodem (internal)	10,700	4,955	10,500	6,000
3Com Sportster 56K Faxmodem (external)	9,580	8,715	9,290	5,515
3Com Courier V. Everything	10,700	9,470	10,700	4,320
K56FLEX MODEMS				
Boca 56K Internet Modem	9,151	5,295	9,829	9,590
Diamond SupraExpress 56e	8,415	7,024	9,593	9,501
Diamond SupraExpress 56i Sp	9,163	9,576	9,638	N/A
E-Tech Cyber Bullet PC56 RVP	9,192	9,583	9,629	1,486
Hayes Accura 56K Fax Modem (internal)	9,012	8,320	7,514	9,891
Hayes Accura 56K Fax Modem (external)	4,426	8,338	7,544	7,825
Motorola ModemSurfr 56K Data/Fax Modem (internal)	9,122	8,142	7,555	9,904
Motorola ModemSurfr 56K Data/Fax Modem (external)	9,107	8,811	N/A	8,736
Practical 56K Internal Data/Fax K56flex	8,298	8,392	7,534	7,561
Zoom/FaxModem 56K	9,576	8,182	7,804	9,952
Zoom/FaxModem 56Kx	9,122	6,299	7,544	9,927

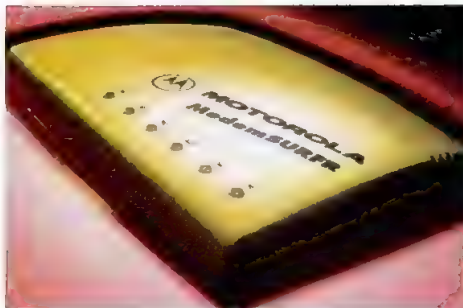
N/A—Not applicable. The product did not complete this test.

BETTER ►

BETTER ►

BETTER ►

BETTER ►



The ModemSurf offers six status lights, but none to indicate speed, error control, or data compression.

trol, or data compression. Installation was uneventful. In testing, the external version was a bit slower than the internal version, perhaps because of differing chip sets.

Motorola is promising to provide a free upgrade to the ITU standard, whether via software, hardware, or modem exchange. Motorola also offers a rebate for all modem trade-ins, even those from other manufacturers.—MDS

ModemSurf 56K Data/Fax Modem. Street price: Internal version, \$160; external version, \$180. Motorola Information Systems Group, Huntsville, AL; 800-426-6336, 205-430-8894; www.mot.com/modems. Circle 498 on reader service card.

Practical 56K Internal Data/Fax K56flex

Because Practical Peripherals is a division of Hayes, we weren't surprised to find that its Practical 56K Internal Data/Fax K56flex (\$150 street) strongly resembled the internal Hayes Accura 56K Modem. The unit we tested, however, was slower and included older firmware that is not flash-upgradable to the new ITU standard.

Installation was standard Plug and Play, with an option to set IRQs through jumpers or software. Performance fell noticeably behind the Accura, putting the Practical modem at the back of the K56flex pack.

Practical says all future versions of firmware will be flash-upgradable. Avoid versions with numbers V0.110 and V0.520; you'll find the version number on the box's bar-code label. Practical guarantees either free software or hardware upgrades to the ITU standard if necessary.—MDS
Practical 56K Internal Data/Fax K56flex. Street price: \$150. Practical Peripherals Inc., Atlanta; 800-225-4774, 770-840-9966; www.practinet.com. Circle 499 on reader service card.

3Com Sportster 56K Faxmodem (internal and external versions), Courier V.Everything



The Sportster 56K modem line (internal version, \$200 street; external version, \$220 street) is a consumer-level product from 3Com (formerly U.S. Robotics). The performance of the two units, was excellent, rivaling that of the higher-priced Courier V.Everything on our tests. The internal version of the Sportster came away an Editors' Choice.

The external Sportster is housed in a wedge-shaped beige box with seven status LEDs. The internal version is an 8-bit Plug and Play ISA card. You can config-



The Courier's wealth of features makes it perfect for unattended answer-mode use with a BBS or remote-access system.

ure the unit manually on older systems.

3Com provides excellent installation instructions. The software bundle is generous, including Netscape Navigator 3.0, VocalTec's Internet Phone, PointCast, AOL, CompuServe, Juno e-mail, and FedEx Ship.

The Courier V.Everything (\$300 street) is a very different animal. It's big—about the size of a hardcover book—allowing plenty of room for features you won't find on smaller boxes, such as a large speaker, a sliding volume control, a rear-panel power switch, and 12 status LEDs that monitor such functions as speed, error control, and data compression. A ten-position DIP switch lets you permanently override software settings such as auto-answer and flow control. Included are the Sportster software bundle and Stampede RO Gold remote-control software.

3Com promises a free upgrade to the ITU standard that even includes a modem exchange, and it offers V.34 Sportster and

Courier customers a \$60 upgrade.—LF
Sportster 56K Faxmodem. Street price: Internal version, \$220; external version, \$200. 3Com Corp., Santa Clara, CA; 800-342-5877 (Sportster), 800-877-2677 (Courier); www.usr.com. Circle 500 on reader service card.

Zoom/FaxModem 56K, 56Kx

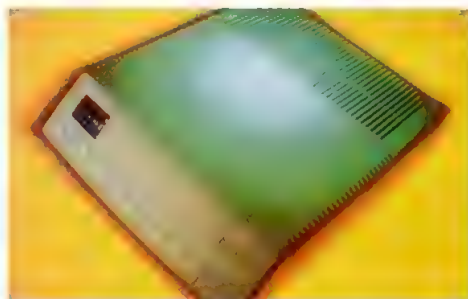
Zoom Telephonics is known for packing extras into its external modems that other vendors pass on, such as lots of status lights. Its K56flex models, the internal Zoom/FaxModem 56K (\$120 street) and the external Zoom/FaxModem 56Kx (\$140 street), continue to please in every area.

Installing the 56K was easy, either via plug-and-play or through jumpers and software for older systems. (A list of modem commands is available from the Web site.) Bundled software includes Symantec's WinFax Lite and COMit.

Our tests showed the 56K to be among the fastest in its class. It produces an unusually high speaker volume, invaluable for troubleshooting connection problems.

The external model is compact but still manages to offer 14 well-conceived status lights that include speed, error control, and data compression. Installation was standard. The unit tested admirably, coming in just behind the internal version overall. Zoom guarantees that a free update to the ITU standard will be available from its Web site. It is also planning to provide a free hardware update, if necessary. In addition, Zoom offers owners of its 33.6-Kbps model a \$79 trade-in.—MDS

Zoom/FaxModem 56K. Street price: \$120. **Zoom/FaxModem 56Kx.** Street price: \$140. Zoom Telephonics Inc., Boston; 800-631-3116, 617-423-1072; www.zoomtel.com. Circle 501 on reader service card. PC



The Zoom/FaxModem 56Kx, an external model, is compact yet offers 14 well-conceived status lights, including error control and data compression.



**Points.
Clicks.**



**Points.
Clicks.
Signs.
Edits.
Writes.
Draws.**

*Cross introduces the revolutionary new **iPen**. It will virtually replace your mouse.*

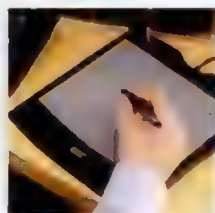
*The Cross **iPen** makes pointing, clicking and navigating around your computer desktop much easier. It gives you greater control than you've ever had before.*

Plus, with different software applications, you can now sign your name. Edit documents with your own handwriting. Write on digital photos. Even receive a fax, make your comments, and fax it off again—all on your computer. And all with the ease and familiarity of writing with a pen.

For over 150 years, Cross Pen has stood for excellence in craftsmanship and quality. We thought it was time we added technology to that list.

*Get the point. Get the **iPen**.*

**The iPen.
Innovative. Intuitive.
Incredible.**



There's
NO image
we can't
improve.™



COLOR PAGEWORKS
\$2,999*

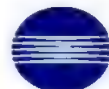
Dull promotional material was no way to herald itself as the vanguard in unsung art. Benson Higby's Velvet Gallery needed an image improvement.

Enter the Minolta Color PageWorks™ printer. It gave Benson an easy and affordable way to enhance his documents. At **\$2,999***, the Color PageWorks printer was well within his budget. He was surprised that the most affordable color laser printer cost less than his one-of-a-kind classic "A Clown's Lament." The Color PageWorks printer was easy to use, too—the patented toner carousel made it a cinch to replace cartridges. And with Minolta's Improve Your Image™ Collection CD, he had an array of templates that gave him an immediate way to improve his everyday documents with the impact of brilliant laser color.

As the leader in color laser technology, Minolta brings plenty to the picture for your business. Like the best price. And over 10 years as one of the largest manufacturers of dependable laser printer engines in the world.

To find out more, visit Minolta's Web site at www.minoltaprinters.com/pcm1 for technical information and the location of the Minolta dealer nearest you. Or call 1-888-2MINOLTA, ext. 27, for more information, a Color PageWorks print sample, and a free CD-ROM.

See for yourself what Minolta can do for your image.



MINOLTA

ONLY FROM THE KING OF MINOLTAS

CIRCLE 340 ON READER SERVICE CARD



Laser Printers Clear, Crisp...and

COLOR!

Color laser printers are finally good enough and affordable enough for mainstream business users—as low as \$3,000. PC Labs tests six color laser-class machines. *By M. David Stone*

The days of the black-and-white printer in the workplace are numbered. This doesn't take a crystal ball to predict. It is already virtually impossible to find a monochrome-only ink jet printer for sale. And as the laser printers we cover here show, color is becoming a reasonably affordable option for workgroup printers as well. True, the color laser printer for personal use might not be just around the corner, but it is somewhere in your future.

Printers, like monitors before them, are moving to color for good reason. Color carries information. It makes business graphs easier to interpret, spreadsheets easier to skim, and text-based reports more inviting to read. It also helps draw the reader in, whether you're printing a brochure, a newsletter, a report, or even a simple business letter with a color logo.

Today's color laser printers deliver good enough color printing at good enough speeds and at low enough prices to make them increasingly attractive for small business and corporate workgroups. They give fine results on regular copier paper and are ideal for documents that intermix color graphics or photographs and laser-quality text.

REVIEW CRITERIA

The range of color printers and color printing technologies is vast, from ink jets at \$200 to thermal dye transfer printers at \$5,000 to \$20,000. In this issue we review color laser printers targeted at business users, as well as color graphics printers targeted at graphics professionals (in the story "Color Graphics Printers: Color for the Pros"). We will be looking at the



IN THIS REVIEW

HP Color LaserJet 3000	123
Lexmark Optra SC 1275	124
Minolta Color PageWorks	125
Tektronix Phaser 350	126
Xerox Color Questor 850	127
Xerox Color Questor 860	128
Xerox Color Questor 870	129
Xerox Color Questor 880	130
Xerox Color Questor 890	131
Xerox Color Questor 900	132
Xerox Color Questor 910	133
Xerox Color Questor 920	134
Xerox Color Questor 930	135
Xerox Color Questor 940	136
Xerox Color Questor 950	137
Xerox Color Questor 960	138
Xerox Color Questor 970	139
Xerox Color Questor 980	140
Xerox Color Questor 990	141
Xerox Color Questor 1000	142
Xerox Color Questor 1010	143
Xerox Color Questor 1020	144
Xerox Color Questor 1030	145
Xerox Color Questor 1040	146
Xerox Color Questor 1050	147
Xerox Color Questor 1060	148
Xerox Color Questor 1070	149
Xerox Color Questor 1080	150
Xerox Color Questor 1090	151
Xerox Color Questor 1100	152
Xerox Color Questor 1110	153
Xerox Color Questor 1120	154
Xerox Color Questor 1130	155
Xerox Color Questor 1140	156
Xerox Color Questor 1150	157
Xerox Color Questor 1160	158
Xerox Color Questor 1170	159
Xerox Color Questor 1180	160
Xerox Color Questor 1190	161
Xerox Color Questor 1200	162
Xerox Color Questor 1210	163
Xerox Color Questor 1220	164
Xerox Color Questor 1230	165
Xerox Color Questor 1240	166
Xerox Color Questor 1250	167
Xerox Color Questor 1260	168
Xerox Color Questor 1270	169
Xerox Color Questor 1280	170
Xerox Color Questor 1290	171
Xerox Color Questor 1300	172
Xerox Color Questor 1310	173
Xerox Color Questor 1320	174
Xerox Color Questor 1330	175
Xerox Color Questor 1340	176
Xerox Color Questor 1350	177
Xerox Color Questor 1360	178
Xerox Color Questor 1370	179
Xerox Color Questor 1380	180
Xerox Color Questor 1390	181
Xerox Color Questor 1400	182
Xerox Color Questor 1410	183
Xerox Color Questor 1420	184
Xerox Color Questor 1430	185
Xerox Color Questor 1440	186
Xerox Color Questor 1450	187
Xerox Color Questor 1460	188
Xerox Color Questor 1470	189
Xerox Color Questor 1480	190
Xerox Color Questor 1490	191
Xerox Color Questor 1500	192
Xerox Color Questor 1510	193
Xerox Color Questor 1520	194
Xerox Color Questor 1530	195
Xerox Color Questor 1540	196
Xerox Color Questor 1550	197
Xerox Color Questor 1560	198
Xerox Color Questor 1570	199
Xerox Color Questor 1580	200

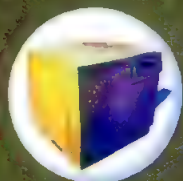
www.pcmag.com

Do you want to find the right color laser printer for your office or workgroup? Then try visiting the interactive version of "Clear, Crisp, and Color" at our Web site.

Color Matching

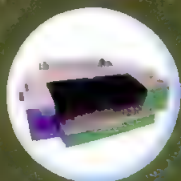
Choose the Printer That Suits Your Needs

Choose the printer that suits your needs: the output quality, the output speed, the cost per page, and features such as the availability of color and the printing.



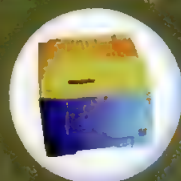
COLOR LASER

The right technology for producing a mix of monochrome and color documents in a shared business environment. Price: \$3,000–\$5,000.



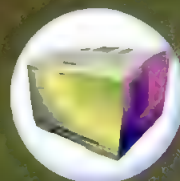
INKJET

Good for individual users where low initial cost is an important factor. Tabletop capability on some models is a plus. Price: \$200–\$2,000.



SOLID INK: DRUM-TYPE

In the business arena, a viable alternative to color lasers, thanks to affordability and good output. Price: \$3,500–\$5,000.



SOLID INK CLASSIC

Meant to compete with thermal dyes for graphics and prepress, a niche solution. Price: \$5,000–\$10,000.



THERMAL DYE

Meant for prepress and professional graphics only. Thermal dye units produce true photo-quality, continuous-tone output. Price: \$750–\$15,000.

	EXCELLENT	GOOD	EXCELLENT	POOR	POOR
Business documents, newsletters	EXCELLENT	GOOD	EXCELLENT	POOR	POOR
Presentations	EXCELLENT	GOOD	EXCELLENT	FAIR	GOOD
Transparencies	EXCELLENT	FAIR	GOOD	POOR	GOOD
Layouts, design comps	GOOD	GOOD	FAIR	EXCELLENT	GOOD
Prepress color proofs	POOR	GOOD	POOR	EXCELLENT	EXCELLENT
Photos	FAIR	GOOD	GOOD	GOOD	EXCELLENT

personal ink jets for home and business users in our next issue, the annual printer blockbuster.

For this roundup, we tested the five color laser printers introduced since our roundup a year ago ("A Spectrum of Choices," October 22, 1996). And again this year, we've included a solid-ink printer that is sold as a laser-class printer: the Phaser 350 from Tektronix. The Phaser 300 was an Editors' Choice in last year's story, and we invited it back to see how it compares with the latest laser competitors. The Phaser prints by spraying ink on a drum and then rolling the drum against the paper. This is vaguely similar to the way lasers transfer toner from a drum to paper, and even more similar to an offset printing press.

Two color laser printers from Panasonic and one from QMS were not available in time for review. The Panasonic KX-P8410 and PS8000 are both built around the same new-generation engine as this year's Tektronix Phaser 560. The

KX-8410 (which should be available for less than \$3,000 on the street by the time you read this) offers up to 1,200-dpi resolution, while the PS8000 (about \$10,000) adds the intriguing touch of an integrated 9,600-dpi color flatbed scanner to let you use the printer as a color copier as well. The QMS *magicolor* 2 series (starting at \$3,000 street) is a 600-dpi printer built around Hitachi's new laser engine.

The engines in the Panasonic and Tektronix printers are from Matsushita, Panasonic's parent company. Other engines that are represented here come from Konica (the HP printer), Minolta (the Lexmark and the Minolta units), Sharp (the Xerox), and Tektronix (the Tektronix Phaser 350).

LOWER PRICES, BETTER RESULTS

Prices for color laser printers are significantly lower than just a year ago. Four have an estimated street price of \$3,000 to \$3,500 for the basic configuration, and the highest such street price is \$5,200. That's a

big drop from last year, when only one printer fell below \$3,500, and the range went up to \$9,000. In fact, the base price for half of the color laser printers we cover is no higher than the original, *monochrome* HP LaserJet's \$3,495 price when that model was introduced in 1984. And that's without taking into account 15 years of inflation.

Falling prices go hand in hand with increased popularity. According to Lyra Research, a research group in Norwood, Massachusetts, 66,500 color workgroup laser printers were sold last year. Lyra predicts that total shipments will grow to 96,100 this year, 155,700 next year, and 410,900 by 2001.

This year's lasers are also aimed as much at workhorse monochrome printing as at color. The cost for a typical double-spaced black-and-white business letter (with about 5 percent toner coverage) ranges from 1.6 cents for the Tektronix Phaser 350 to 2.7 cents for the Lexmark Optra SC 1275n—much the same range you'll find for monochrome laser printers. More important, text quality is within the range you would expect for a monochrome laser printer, which hasn't always been true in the past.

Our Contributors: M. DAVID STONE is a contributing editor of *PC Magazine* and author of *The Underground Guide to Color Printers* (Addison-Wesley, 1996). JAMES KARNEY is a frequent contributor to *PC Magazine*. JAMIE M. BSALES was the associate editor in charge of this story, and JEFF MACE was the project leader.

HARDWARE

Color Laser Printers

Tektronix and Xerox laser printers—can also print photos at something approaching true photographic quality.

SPEED AND COST ISSUES

As a category, lasers are generally faster than other color printing technologies: ink jet, solid ink, thermal dye, or thermal wax. The engines in laser printers in this roundup are rated at 10 pages per minute (ppm) through 14 ppm for monochrome jobs, and 3 ppm to 6 ppm for color. All of the laser printers we reviewed also offer network support, either standard (in the case of the HP Color LaserJet 5M, Lexmark Optra SC 1275n, and Xerox DocuPrint C55mp) or optional (\$450 to \$600). And good throughput is important, since multiple users will be sending jobs to the printer.

Note that the printer language a model uses can also affect speed. Five of the printers in this roundup come with PostScript Level 2 support (which is the standard printer emulation in the graphics community), and the other one offers it as an option. But PostScript files tend to take longer to print than PCL files.

Cost per page is also an important consideration. Alas, you can't take vendors' claims too seriously when comparing models. Each vendor is free to compute the price per page differently—assuming different percentages of each toner or ink for any given coverage of the page, and either including or leaving out such consumables as the photoconductor, fuser, and fuser oil.

As already mentioned, the claimed cost per monochrome page for color laser printers is about the same as for monochrome laser printers. The claimed cost for a typical color business page (say, a report with a pie chart, which would equal roughly 25 percent coverage) ranges from a low of 7.5 cents for the HP Color LaserJet 5M to 18 cents for the

Tektronix Phaser 560 in 1,200- by 1,200-dpi mode. A fully covered color printout (a photo, for example) might cost anywhere from 30 cents (in the case of the Xerox DocuPrint) to 63 cents (the Tektronix Phaser 560). As a point of reference, the claimed range for ink jet printers is approximately the same.

Last year, we suggested that color lasers were finally grown up and ready for the real world—if you picked carefully. This year, there are more good choices to pick from. It's not as hard to find a laser printer that will let you print good-looking color graphics and photos on plain paper, along with monochrome output that matches the laser-quality text you're used to seeing.

If you're looking for color in business documents, it's time to take color lasers seriously indeed. They make a fine complement to your existing laser printers. And thanks to lower prices and more attractive per-page costs, a small office may even consider buying one as its only office printer.

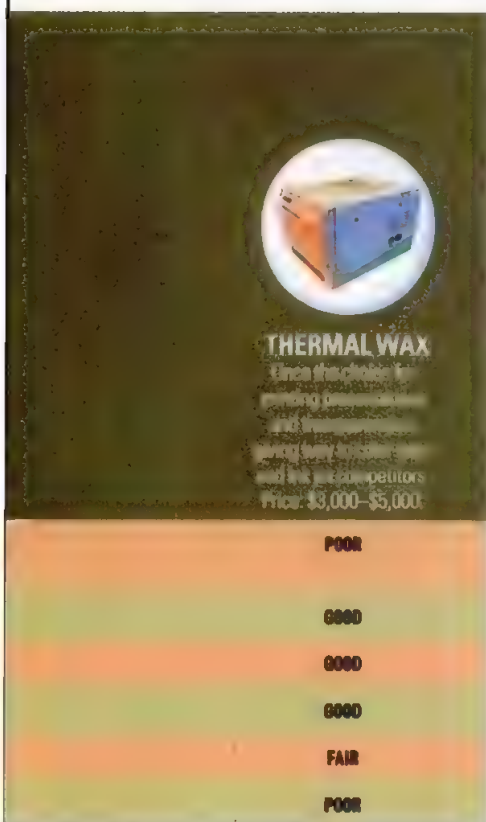
HP Color LaserJet 5M

SPECIFICATIONS: Legal-capable laser printer; 10 ppm monochrome, 3 ppm color. Resolution: 300 dpi standard, 1,200 dpi maximum. Input capacity: 250 sheets. Tested configuration: \$5,200 street.

Printer-industry giant Hewlett-Packard is known for its high-quality monochrome laser printers and color ink jets. But in the past we found that the vendor's color laser models suffered from serious flaws in output. Unfortunately, this is still the case for the HP Color LaserJet 5M, which



The HP Color LaserJet 5M offers low per-page costs and easy connectivity, but its output quality trails the pack.



This newfound suitability for monochrome means that you can get a single laser printer in a small office for both color and monochrome printing. In a larger office, it means that you can hang the color printer on a network and not have to reserve it strictly for color print jobs.

Another trend very much worth noting is that this year's crop of color lasers offers better-looking output overall than last year's entries. The improvement is tied to a new generation of engines, which do a better job of laying down color evenly and a better job of registration for the colors, so you don't see, for example, a thin white gap between the outside edge of a pie chart and the background color.

This doesn't mean you won't see artifacts like banding in gradients, but it does mean that the output flaws you may find are forgivable. Last year we noted that, for the first time, you could find color lasers with output that looked good enough that you wouldn't have to apologize for it. This year, finding that level of output quality is easier. For the color lasers we tested, you'll see saturated colors for graphics and photos, making them more than acceptable for business graphics. A few of the printers—notably the

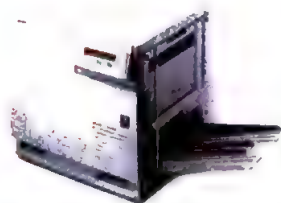


**SO WHAT'S
YOUR IDEA
OF GREAT
COLOR?**

It really doesn't matter if you're talking a primarily red, yellow and blue presentation or a polychrome universe with a gradient filter and glass distortion like this. You can get a real laser class printer — with vibrant Tektronix® color — to match your artistic heart as well as your business head.

From the workhorse, workgroup Phaser® 350 printer with a bottom line price of \$2,995.* To the high-speed, full 1200 dpi Phaser® 560. All the way up to the graphic arts photo-realistic printers that have made Tektronix a color standard. So however you see color, just remember this. If you can dream it up, we've got a way to get you there.

To show off your own idea of color, just call us at 1-800-835-6100 ext. 1524, or visit us at www.tek.com/CPad?1524



Tektronix®

*Estimated U.S. selling price. Reseller price may vary. ©1997 Tektronix, Inc. All rights reserved. Tektronix and Phaser are registered trademarks of Tektronix, Inc.

CIRCLE 001 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink

is targeted at business users with networking needs.

The printer is available in two versions: the HP Color LaserJet 5, with PCL 5C emulation only, and the HP Color LaserJet 5M, which adds Adobe PostScript Level 2. We looked at the latter model, which comes with 36MB of RAM, an external print server box for Ethernet- or Token-Ring-based networks, and a number of third-party products that support a variety of network operating systems.

Output quality from the LaserJet's Konica engine doesn't measure up to the competition. Although thin lines and areas of color were filled in solidly on our tests in both PCL and PostScript modes, gradients showed obvious banding. Photos revealed streaks, dithering, and a sense of flattening that comes from a lack of subtle shading.

The LaserJet was a midrange performer on our speed tests. It did excel on our Adobe PhotoShop test, delivering the image in 6 minutes 11 seconds—more than a minute faster than the second-place finisher.

Where LaserJet does stand out is in claimed cost per page. HP estimates that a typical color business graphic (25 percent color coverage) should cost 7.5 cents—about half the average for the products in this roundup. A simple monochrome business letter (5 percent coverage) should cost less than 2 cents, which is right in line with what a monochrome network laser printer's output would cost. The bean counters don't have to worry about users running monochrome jobs on this printer. Another plus in a networked environment is HP's software JetAdmin, which lets an administrator easily set up and monitor all the printer resources on a given network.

In general, the HP Color LaserJet 5M is disappointing, with unimpressive output at an unimpressive print speed. Although some users may consider the product adequate for simple business charts and presentations, it is nevertheless outclassed by competitors that cost less. All of this makes the LaserJet hard to recommend.—*M. David Stone*

Hewlett-Packard Co., Palo Alto, CA; 800-752-0900, 415-857-1501; www.hp.com. Circle 441 on reader service card.

Editors' Choice

• Tektronix Phaser 560



The color laser printers in this roundup

are equipped with manufacturers' second-generation engines, and the improvements in output quality and speed are noticeable.

Our Editors' Choice is the Tektronix Phaser 560 (\$5,000 street), the follow-up to last year's Editors' Choice-winning Phaser 550. Tektronix has improved on the fine output we saw from the previous model, providing no-excuses color reports and presentations for business professionals. The charts and graphs we produced showed crisp edges, with no registration problems, solidly filled-in areas of well-saturated color, and perfect laser-quality black text. Photo images (printed in the somewhat slow 1,200-dpi mode) were well balanced, with good detail, barely visible dithering, and accurate colors and skin tones. The print speed was also very good—14 pages per minute monochrome and 5 ppm

color—making the Phaser 560 a fine choice for a shared-workgroup environment.

A close second to the Phaser 560 was the Lexmark Optra SC 1275n (\$4,450 street), which merits an honorable mention. It too produced stunning business graphics speedily, with bright colors and clean lines. Photo reproduction, though a step behind the Phaser 560, was still admirable. Lexmark's excellent administration utility MarkVision rounds out this compelling package.

Three other printers in this roundup are not as strong as these two but are worthy of your attention. The Xerox DocuPrint C55mp (\$4,780 street) delivered good print quality, and extras such as the vendor's administration software CentreWare Internet Services make the product a good fit for the corporate environment. We were also impressed with Minolta's low-cost Color PageWorks (\$3,080 street). Business users who need a solid color printer on a budget won't be disappointed. Similarly, the Tektronix Phaser 350 (\$3,080 street) delivers acceptable color output at a very competitive price.

Lexmark Optra SC 1275n

SPECIFICATIONS: *Legal-capable laser printer; 12 ppm monochrome, 3 ppm color. Resolution: 600 dpi. Input capacity: 400 sheets standard, 650 sheets maximum. Tested configuration: \$4,450 street.*



The Lexmark Optra SC 1275n delivers a nice blend of speed, output quality, and ease of use.

Lexmark International's Optra SC 1275n has an appealing blend of robust features, good drivers, and fine output quality. Designed for workgroup users who need color and PostScript capability, the Optra SC hits its mark and provides an attractive value for its price.

The printer is built around Minolta's new engine and competes against Minolta's own less expensive Color PageWorks, also reviewed in this roundup. Setting up the Optra SC is almost as easy as installing a monochrome laser printer: The four toner cartridges slip into a color-keyed carousel. The MarkVision management software all but loads itself, and it lets you control a comprehensive array of modes, resolutions, and settings from a series of menus. It also lets you track print jobs and usage directly from the PC. For most jobs, you can leave the

Is lack of support ending
your infatuation with your
current P.C.?



Well here's living proof customers just love Quantex.

OVERALL RANKINGS

PC VENDOR	GRADE
Quantex	Excellent
Dell	
Hewlett-Packard	
IBM	
Compaq	
Gateway 2000	Good
Micron	
NEC	
Acer	Fair
AST	
Toshiba	
AT&T	Poor
Digital	
Peckard Bell	

Windows Magazine, 2/97

WOULD YOU BUY AGAIN?

VENDOR	% WHO WOULD BUY THE SAME BRAND
Dell	92%
Quantex	91%
Hewlett-Packard	89%
IBM	89%
Micron	81%
Gateway	80%
Acer	74%
AST	74%
NEC	71%
AT&T	69%
Digital	69%
Toshiba	61%
Compaq	58%
Peckard Bell	51%

Windows Magazine, 2/97

"Quantex, making its debut in the desktop category, quickly resolves its callers' problems an impressive 47 percent of the time, compared with the survey average of 31 percent."

PC Magazine 7/97

"★★★★" Buy again based on service and support

PC World 5/97



Here's 2 more reasons to love

The competition can't measure up to our fastest system ever.

Our QP6/300 SM-4x has a mind-boggling 300 MHz Pentium® II Processor, just for starters. And an eye-opening 19" monitor to let you see all this speed in action. We follow this up with a huge 8GB Enhanced IDE hard drive to provide all the space you need. Then throw in Matrox's quickest video card with new AGP technology--the Millennium II with 4 MB of WRAM-- for a combination of speed, power and visual fireworks that can't be beat. All backed by Quantex's award winning service and support, including 24 x 7 tech support from living, breathing experts.



QP6/300 SM-4x **\$3399**
(featuring Pentium® II processor)

Business lease: \$111/Mo.

- 300MHz Pentium® II Processor
- Intel 440LX PCI Chipset
- 2 Universal Serial Bus (USB) Ports
- 64MB SDRAM Memory / 512KB Secondary Cache
- 8GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- AGP Matrox Millennium II 3D w/4MB WRAM
- Upgrade to AGP Matrox Millennium II 3D w/8MB WRAM for only \$99
- 19" Digital Monitor (18.1" viewable)
- K56flex™ protocol Fax/Modem w/Voice Mail and Speakerphone
- 24X Max EIDE CD-ROM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- Altec Lansing ACS-45 Speakers w/subwoofer
- ATX Case
- 104-Key Keyboard With MS IntelliMouse
- MS Windows '95 With MS Plus
- Power Multimedia Software Bundle
- 3-year limited warranty, 24-hr./7-day Technical Support

QP6/233 SM-4x (featuring Pentium II processor) **\$2999**

QP6/266 SM-4x (featuring Pentium II processor) **\$3149**

Special Upgrade to DVD-ROM* & DVD Decoder for only \$199 (for SM-4x)

* Required for M1 (3-ARM)

Power Multimedia Series

Standard Features

- 2 Universal Serial Bus (USB) Ports
- K56flex™ protocol Fax/Modem w/Voice Mail and Speakerphone
- 24X Max EIDE CD-ROM Drive
- Ensoniq 32-Bit Wavetable Sound Card
- 104-Key Keyboard With MS IntelliMouse
- MS Windows '95 With MS Plus
- Power Multimedia Software Bundle
- 3-year limited warranty, 24-hr./7-day Technical Support
- Mid-Tower Case

QP5/233 SM-1 **\$1799**
(with MMX™ Technology)

Business lease: \$63/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- 32MB EDO Memory / 512KB Secondary Cache
- 3.2GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- STB Nitro 3D with 4MB
- 15" Digital Monitor (14.0" viewable)
- Altec Lansing ACS-90 Speakers

QP5/200 SM-1 (with MMX Technology) . . . **\$1699**

QP6/233 SM-1x (featuring Pentium II processor) **\$1999**

QP6/266 SM-1x (featuring Pentium II processor) **\$2149**

SOFTWARE BUNDLE

- MS Office '97 SBE ■ MS Money '97 ■ Office Mate ■ Day Planner Pro ■ Power Business Plans ■ Form Designer Pro ■ Project Manager Pro ■ Labels Unlimited
- Compton's Reference Collection ■ Dr. Solomons Anti-Virus ■ Windows 95 with MS Plus ■ One-month trial memberships to AOL, CompuServe and Prodigy

UPGRADES ■ Panasonic PD/CD-Rom Drive w/ one 650MB PD cartridge \$ 249 ■ Microsoft Natural Keyboard (upgrade from 104-keyboard) \$ 39 ■ HP Deskjet 692C Printer (w/photo color kit) \$ 299

QP6/233 SM-2x **\$2249**
(featuring Pentium® II processor)

Business lease: \$78/Mo.

- 233MHz Pentium® II Processor
- 32MB EDO Memory / 512KB Secondary Cache
- 4GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- STB Nitro 3D with 4MB
- 17" Digital Monitor (16.1" viewable)
- Altec Lansing ACS-90 Speakers
- Upgrade SM-2 to 64MB EDO RAM and 5.1GB HD for only \$150

QP5/200 SM-2 (with MMX Technology) . . . **\$1899**

QP5/233 SM-2 (with MMX Technology) . . . **\$2049**

QP6/266 SM-2x (featuring Pentium II processor) **\$2399**

QP6/266 SM-3x **\$2699**
(featuring Pentium® II processor)

Business lease: \$95/Mo.

- 266MHz Pentium® II Processor
- Intel 440LX PCI Chipset
- 64MB SDRAM Memory / 512KB Secondary Cache
- 6.4GB EIDE Mode 4 HD / 3.5" 1.44MB Floppy Drive
- STB AGP Graphics Card with 4MB
- 17" Digital Monitor (16.1" viewable)
- Altec Lansing ACS-45 Speakers w/subwoofer

QP6/233 SM-3x (featuring Pentium II processor) **\$2549**

QP6/300 SM-3x (featuring Pentium II processor) **\$2999**

us. And never leave us.



Our new notebook. The toughest competition the top-rated notebook's ever had.

THE POINT AT WHICH YOUR NOTEBOOK MEETS YOUR DESKTOP.

Quantex is proud to say that we are one of the last to introduce a notebook.

Why? Because, unlike our competition, we waited until we could

combine Intel Mobile Module Architecture, a 13.3" XGA Active

Matrix screen and a 3GB removable hard

drive with all the latest technologies

for maximum versatility and

expandability in a notebook. Meridian

H Series notebooks: they're the equal

of the top performing desktops and

backed with our acclaimed 24-hour

7-day live tech support. For further

information check out our website:

www.Quantex.com



Meridian H 1331 \$4499

Business lease: \$146/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module Architecture
- 13.3" XGA Active Matrix Display
- 64MB SDRAM (expandable to 144MB) / 512KB Pipelined Burst Cache
- 3GB HD / 3.5" 1.44MB Modular Floppy Drive
- PCMCIA 33.6k Fax/Modem
- 20X Max Modular CD-ROM Drive
- PCI Bus with 128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers
- Smart Lithium Ion Battery
- USB and Fast IR Ports
- Integrated Personal Touchpad
- MS Windows '95
- MS Office '97 SBE
- Carrying Case
- 24-hr./7-day Technical Support
- 3-year limited warranty on CPU and Main Memory
- 1-year parts and labor limited warranty on all other components

● 13.3" XGA Active Matrix Display

● New! Intel 430 TX PCI Chipset

● USB and Fast IR Ports

● PCI Bus with 128-Bit Graphics Accelerator

● Intel Mobile Module (IMM) architecture

● 233 MHz Pentium® Processor with MMX™ Technology

Standard Features ■ 3.5" 1.44 Modular Floppy Drive

- 20X Max Modular CD-ROM Drive ■ PCI Bus w/128-bit graphics accelerator
- Integrated 16-bit Stereo Sound and Speakers ■ Touchpad
- Smart Lithium Ion Battery ■ USB and Fast IR Ports

Meridian H Series

Meridian H 1211 \$3499

Business lease: \$114/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module Architecture
- 12.1" SVGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB)/512KB Pipelined Burst Cache
- 2GB HD
- PCMCIA 33.6K Fax/Modem
- Windows 95
- Carrying Case

SUPPORT POLICY

- 30-day money back guarantee ■ One-year Parts and Labor limited warranty ■ 3 years limited warranty on CPU and Main Memory ■ 1-year Depot Repair ■ 1-year express Replacement limited warranty ■ 24-hr./7-day Toll Free Technical Support

OPTIONS ■ Mini-Docking Station...\$199 ■ 2nd Lithium Ion Battery...\$199 ■ PCMCIA Network Adapter...\$129

- PCMCIA 33.6k Fax Modem...\$129 ■ Deluxe Carrying Case...\$99

Meridian H 1330 \$3999

Business lease: \$130/Mo.

- 233MHz Pentium® Processor with MMX™ Technology
- Intel Mobile Module Architecture
- 13.3" XGA Active Matrix Display
- 32MB SDRAM (expandable to 144MB)/512KB Pipelined Burst Cache
- 3GB HD
- PCMCIA 33.6K Fax/Modem
- Windows 95
- Carrying Case



1.800.346.6572

www.quantex.com

shipping or minus tax. All returned items must have a conspicuous RMA number issued by Quantex and be in original packaging. 30-day money-back policy does not include return freight or original shipping/handling charges. Quantex is not responsible for errors in typography or photography. Pentium, MMX, Intel and the Intel Inside logo are registered trademarks of Intel. Microsoft, and Windows are registered trademarks of Microsoft Corporation. K56Flex is a trademark of Lucent Technologies and Rockwell Int'l. All other company trademarks are trademarks of each respective company.

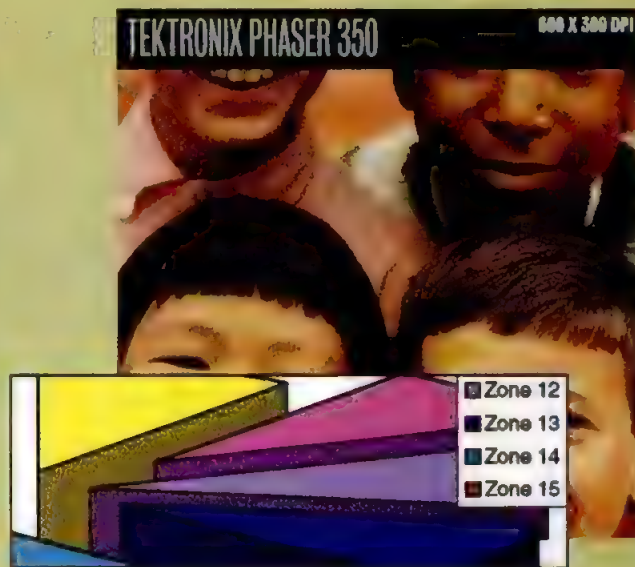
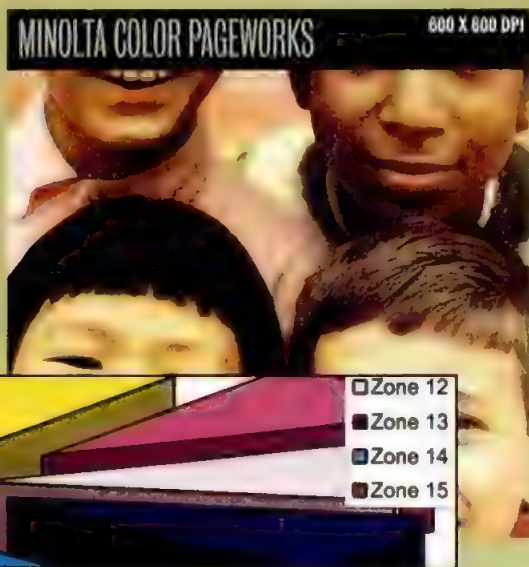
CIRCLE 074 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

Color Output Comparisons: Some Good, Some Better

We printed a typical business pie chart from Microsoft Excel and a photo from Adobe PhotoShop to see how well these six printers would fare using the optimum settings each vendor reported to us. (Note that the resolution we used might not be the highest the printer offers.)

All six units produced at least an acceptable business graphic. Colors are generally bright and well saturated, and we didn't see any registration problems (color misalignments, causing halos at the edges of objects), which we had seen from the previous generation of color lasers. We did detect a bit of banding in the sample from the HP Color LaserJet 5M. But all of the printers are fine for corporate reports, letters, and presentations.

The photo sample separated the good printers from the excellent ones. Here the Tektronix Phaser 560 (our Editors' Choice) was the clear winner. It reproduced the skin tones and colors of our original photo most accurately, and its 1,200-dpi resolution in high-quality mode meant there were no discernible dots or dithering patterns.



Optra SC set to its defaults, but making an adjustment takes just a few mouse clicks. The interface is simple and supported by a thorough manual.

In operation, the Optra SC is an able performer. It was relatively fast on our test suite, finishing first on two of our five color speed tests. Output quality was very good, a close second to the class-leading Tektronix Phaser 560 in this roundup. Registration is solid, producing sharp lines, solid colors, and clean black type. Colors were well saturated and even. Lexmark's image enhancement technology

(to a simulated 1,200 dpi) gives the Optra SC an edge over some competing laser printers for complex graphics and photos. Our Corel gradient fills were smoother, with less banding. Photographs were also more even in tone and showed more detail in shadow areas.

The Optra SC is a good choice for business users who need PostScript and want first-class software controls. It packs a lot of value for the money.—James Karney
Lexmark International Inc., Lexington, KY; 800-539-6275, 606-232-2000; www.lexmark.com. Circle 442 on reader service card.

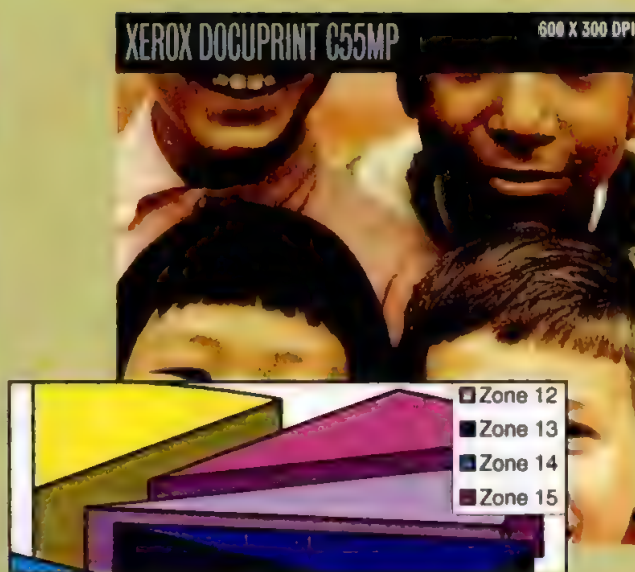
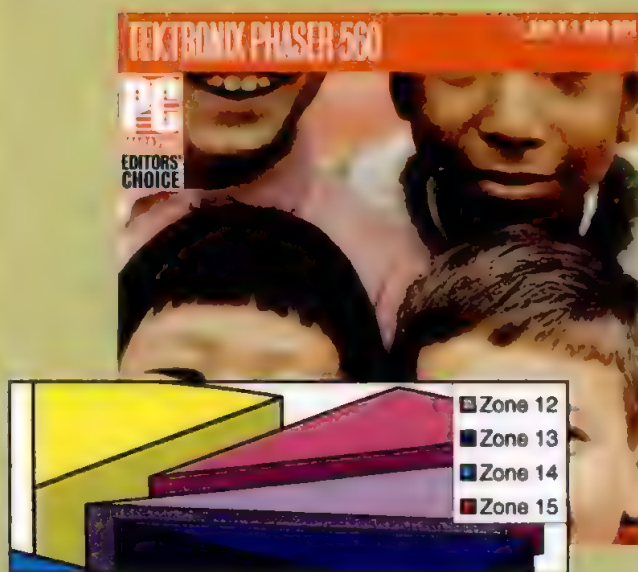
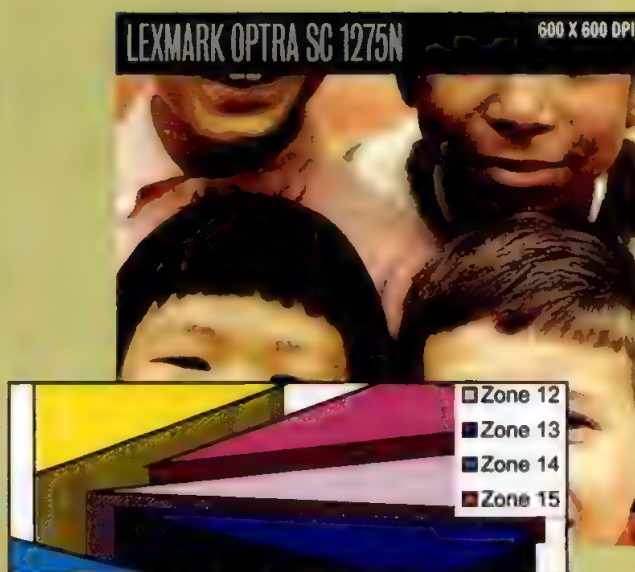
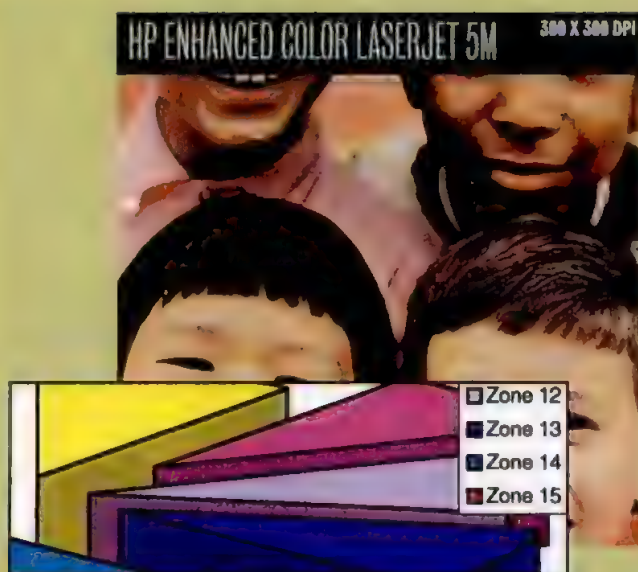
Minolta Color PageWorks

SPECIFICATIONS: Legal-capable laser printer; 12 ppm monochrome, 3 ppm color. Resolution: 600 dpi. Input capacity: 250 sheets standard, 500 sheets maximum. Tested configuration: \$3,080 street.

Minolta Corp.'s Color PageWorks is aimed squarely at the business graphics market, and it hits the target with solid performance, decent output, easy operation, and the lowest price of any printer in this roundup.

The basic PageWorks comes with only 4MB of RAM, though the con-

HARDWARE
Color Laser Printers



The least-expensive printer we tested, Minolta's Color PageWorks is worth a look.

troller's memory compression technology enables it to handle color business output such as charts and graphs. For more graphics-intensive use, as with photos, you'll want to boost the RAM (we tested with 16MB). Also note that the standard bundle lacks built-in networking or PostScript support, but both of them are available to you as options (\$449 list for an Ethernet card, \$529 for the PostScript module).

Setting up the unit is as simple as slipping the four toner cartridges into a carousel and loading the Windows driv-

ers. The drivers' wizard function is excellent, eliminating the need for custom settings for most users. One unique feature is Minolta's new ink transfer design, utilizing a solid mass of silicon oil that is melted as needed. All four of the ink colors are laid down on a transfer roll before the paper starts to move, providing a straight path that lets the printer handle any type of paper, label, or card stock up to 90-pound weight.

Registration and alignment were excellent on our output samples, though there was some banding in our gradient

PERFORMANCE TESTS

Color Laser Printers



No other color printing technology comes close to lasers for output speed. Thus, they're the only viable choice in a shared business environment. The units

we tested were fairly speedy for typical business applications, though reproducing a high-resolution photo image slowed them considerably.

What the Numbers Mean

On our Freelance Graphics test, and to a lesser extent on our Microsoft Publisher test, the best predictor for performance was raw processing power. The Lexmark Optra SC 1275n (with its 66-MHz processor) and the Xerox DocuPrint C55mp (with its 50-MHz processor) were clearly in the lead. The others bunched fairly closely together, all using 33-MHz or 40-MHz processors.

The Tektronix Phaser 350, a solid-ink printer, was the slowest in the group. Its performance could have been faster at 300 by 300 dpi, but we chose 600-by-300 for better output and for the closest match with the 600-by-600 or better resolution of the competition.

We used the same file for the Freelance Transparency and Freelance Graphics tests. As the chart shows, none of the laser printers slowed down much when printing transparencies.

All of the Adobe Photoshop scores fell into a very narrow range, except for the significantly slower Tektronix Phaser 560 and Xerox DocuPrint C55mp—which, however, offer some of the best output for photos. The Tektronix printer's slowness is most likely related to its 1,200- by 1,200-dpi resolution, and the Xerox unit's comparative sluggishness at 600 dpi is probably due to its contone mode, which paints multiple shades for each printed color.

On our two monochrome tests, the best predictor for perfor-

mance was each printer's rated engine speed. (Interestingly, this was also true on the color Excel test.) The 14-ppm Tektronix Phaser 560 took top honors, followed closely by the 12-ppm printers from Xerox and Minolta. The Xerox printer beat out the Minolta thanks to its 50-MHz processor and 40MB of RAM; the Minolta gained third-place monochrome scores thanks to its use of PCL—which generally has a speed advantage over PostScript. The solid-ink Tektronix Phaser 350 posted the last-place scores.

—Analysis written by M. David Stone

How We Tested

For each color laser printer, we defined a *standard* mode and a *photo-quality* mode based on discussions with the manufacturer. We used the standard mode everywhere except for the Adobe Photoshop test, and we chose settings to match what users are most likely to use. For the PhotoShop test, we selected photo-



quality mode, which often uses the highest-quality settings available for the printer. We used standard copier paper on all tests.

The **Freelance Graphics** test prints a three-page color slide presentation containing pie charts, bar graphs, and a bitmapped photo image

on a gradient-filled background.

The **Adobe PhotoShop** test prints a one-page photographic bitmapped image.

The **Microsoft Excel for Windows** test prints a two-page spreadsheet with color line graphs, bar graphs, and pie charts. We also ran this test in monochrome mode.

The **Microsoft Publisher** test prints a one-page newsletter containing text, color graphics, and a color bitmapped photo image.

The **Freelance Transparency** test prints the same pages we used for our Freelance Graphics test, this time on letter-size film.

The **Microsoft Word for Windows** test prints a five-page black-and-white text document that uses different fonts and type sizes.

	Default resolution Dots per inch	Freelance Graphics Minutes:seconds	Adobe PhotoShop Minutes:seconds	Microsoft Excel for Windows Minutes:seconds	Microsoft Publisher Minutes:seconds
HP Color LaserJet 5M	300 x 300	4:48	6:11	1:27	1:55
Lexmark Optra SC 1275n	600 x 600	2:20	7:37	1:08	0:55
Minolta Color PageWorks	600 x 600	3:25	9:20	1:02	0:59
Tektronix Phaser 350	600 x 300	5:52	7:38	1:40	1:51
Tektronix Phaser 560	600 x 600*	4:38	28:15	1:01	1:17
Xerox DocuPrint C55mp	600 x 600**	2:36	19:14	1:00	1:30
		◀ BETTER	◀ BETTER	◀ BETTER	◀ BETTER

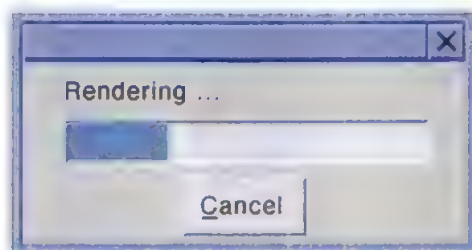
* The PhotoShop image was printed at 1,200-by-1,200 resolution. ** The PhotoShop image was printed at 600-by-300 resolution.

	Default resolution Dots per inch	Freelance Transparency Minutes:seconds	Microsoft Word for Windows (monochrome) Minutes:seconds	Microsoft Excel for Windows (monochrome) Minutes:seconds
HP Color LaserJet 5M	300 x 300	5:15	1:13	0:48
Lexmark Optra SC 1275n	600 x 600	2:49	0:56	0:41
Minolta Color PageWorks	600 x 600	4:07	0:51	0:38
Tektronix Phaser 350	600 x 300	5:55	3:13	1:39
Tektronix Phaser 560	600 x 600	5:18	0:42	0:31
Xerox DocuPrint C55mp	600 x 600	2:47	0:44	0:31
		◀ BETTER	◀ BETTER	◀ BETTER

Test-bed

We tested these six color laser printers using a Micron Millennia P200 system equipped with 32MB of RAM, a 2.1GB Western Digital Caviar hard disk, and an 8X Hitachi CD-ROM drive.

We conducted speed tests with the printers connected to our test-bed via a parallel port.



Approximating True Colors with Dithering

One of the output-quality issues with most printers is visible dithering in graphics and photos. The problem is that most images need shades of colors or gray, but most printers don't literally produce shades: At any point, either a given color appears or it doesn't. This type of printer is known as a *bilevel* printer. The most common way around the problem is *dithering*, which combines dots on the page in a way that fools the eye into seeing shades and colors that aren't really there.

With a monochrome printer, for example, you can map the printer dots onto a grid divided into tiny *dithering cells*, with some arbitrary number of dots in each cell. You can then treat each dithering cell as a picture element, or *pixel*, in the image. If a cell has, say, 5 dots across and 5 down, you can print each pixel in any one of 26 values of gray—from "0," or pure white, through 25 increasingly dark shades—by using from 0 to 25 printer dots per pixel.

For color printers, you do the same thing with each color. So with 26 possible values each for cyan, yellow, and magenta, you can create 17,576 colors

(the total number of possibilities being $26 \times 26 \times 26$). Black doesn't count, because black is not normally combined with other colors in conventional color printing.

One cost of dithering is that the effective resolution for the printer is based on the number of dithering cells. With dithering cells of 5 dots across and 5 dots down, the effective resolution on a 300-dpi printer is only 60 dpi—300 divided by 5. Another issue is that a block of cells with the same color can show visible patterns from the dithering, like the squares on a tiled floor. Variations in implementation can make the dithering patterns less visible, but they are always there.

To avoid dithering entirely, you need a technology like thermal dye printing, which can print each primary color—cyan, yellow, and magenta—at any of 256 values, or *levels*. By printing each of the three colors on top of each other, you can print any one dot in any of about 16.7 million colors ($256 \times 256 \times 256$). This *continuous-tone* printing is fine-grained enough that the human eye can't see the steps from one color to the next without a magnifying glass.

A few printers minimize the size of dithering cells by offering *multilevel* or *contone* printing. Contone printers, unlike bilevel printers, can print more than one shade of each color per dot, but not 256 shades like thermal dye printers. Thus they still need dithering to produce 16.7 million colors, though they don't need as many dots per cell to simulate a given number of colors. For some images, contone printing can hide the dithering entirely, but the results are still not up to the level of a true continuous-tone printer.

Note too that smaller dithering cells make for a higher effective resolution. A contone printer like the Xerox DocuPrint C55mp—a laser printer with 16 levels—actually shows less obvious dithering at 600 by 300 dpi in contone mode than at 600 by 600 dpi in bilevel mode.

The basic rule: "Dots per inch" matters, but it doesn't tell you everything you need to know: The number of levels a printer can produce is just as important for graphics output. And don't settle for *contone* if you actually need *continuous-tone* output. —MDS

fills. Color on business charts was well saturated, with good contrast and crisp, clean text. Our Freelance Graphics presentation page (which features graphics and a photo on a tough-to-reproduce solid background) was crisp, with clean text, solid fills, and excellent contrast. Photographs were a bit more challenging for the PageWorks; it tended to oversaturate colors, and shadow areas tended to lack fine detail and subtle highlights. The printer was an average performer on our color speed tests.

To sum up, the Minolta Color PageWorks is one of the better values in this roundup. When bundled with some of the optional add-ons, it should suit the needs of most business users admirably.—JK

Minolta Corp., Mahwah, NJ; 888-264-6658, 201-512-5800; www.minoltaprinters.com. Circle 443 on reader service card.

Tektronix Phaser 350, Phaser 560



PHASER 350 SPECIFICATIONS: Letter-capable solid-ink printer; 6 ppm monochrome, 6 ppm color. Resolution: 300 dpi standard, 600 dpi maximum. Input capacity: 200 sheets standard, 700 sheets maximum. Tested configuration: \$4,000 street.

PHASER 560 SPECIFICATIONS: Legal-capable laser printer; 14 ppm monochrome, 5 ppm color. Resolution: 600 dpi standard, 1,200 dpi maximum. Input capacity: 250 sheets standard, 750 sheets maximum. Tested configuration: \$5,000 street.

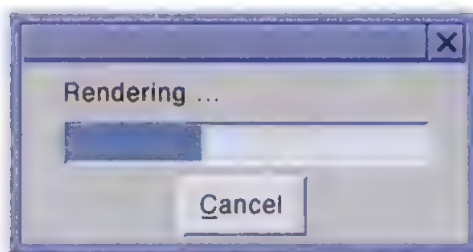
Tektronix offers two strong contenders in the color laser printer category. The Phaser 350 is actually a solid ink printer designed to compete with color lasers. It does so effectively, and it won an Editors' Choice award here last year; now it returns at a lower price.

The Phaser 560 is a true laser printer,

and it serves as a replacement for the Phaser 550, another Editors' Choice last year. Both the Phaser 350 and the Phaser 560 can serve as workhorses for all of your color and monochrome business printing.

The basic versions of these two Tektronix printers don't include network support. But they do have options for Ethernet, LocalTalk, and Token-Ring, together with EthernTalk, NetWare, and TCP/IP support.

One of the Phaser 350's strengths is its ease of setup. Plug in the cables, add some wax blocks, turn on the printer, and wait for the wax to melt. The front panel will warn you when you need to add more wax. Software installation is similarly straightforward. The extended version we review here provides 24MB of RAM, a boost to 600- by 300-dpi resolution, and the ability to queue print jobs. Note, too, that Tektronix continues to offer black ink for free



**How long have you been waiting
for a faster PC Workstation?**

Color Laser Printers



■ YES ■ NO □ OPTIONAL

Products listed in alphabetical order

	HP Color LaserJet 5M	Lexmark Optra SC 1275n	Minolta Color PageWorks	Tektronix Phaser 350	Tektronix Phaser 560	Xerox DocuPrint C55mp
List price, tested/basic configuration	\$6,350 / \$6,350	\$4,999 / \$4,999	\$3,499 / \$2,999	\$4,495 / \$3,175	\$5,495 / \$4,995	\$5,695 / \$4,995
Street price, tested configuration	\$5,200	\$4,450	\$3,080	\$4,000	\$5,000	\$4,780
List price, Ethernet adapter	Included	Included	\$449	\$595	\$595	Included
Base/maximum/tested RAM	36MB / 76MB / 36MB	32MB / 192MB / 32MB	4MB / 88MB / 20MB	8MB / 24MB / 24MB	8MB / 72MB / 40MB	24MB / 64MB / 40MB
Standard/maximum resolution (dpi)	300 / 1,200	600 / 600	600 / 600	300 / 600	600 / 1,200	600 / 600
RAM needed for maximum resolution	36MB	32MB	4MB	24MB	24MB	24MB
Rated engine speed, monochrome/color	10 ppm/3 ppm	12 ppm/3 ppm	12 ppm/3 ppm	6 ppm/6 ppm	14 ppm/5 ppm	12 ppm/3 ppm
Printer-engine manufacturer	Konica	Minolta	Minolta	Tektronix	KME	Sharp
Processor manufacturer/speed	AMD/40 MHz	Intel/66 MHz	Intel/33 MHz	AMD/33 MHz	AMD/33 MHz	AMD/50 MHz
Highest PCL supported	PCL 5	PCL 6	PCL 5c	PCL 5	PCL 5	PCL 5c
Highest PostScript supported (price)	Level 2 (included)	Level 2 (included)	Level 2 (\$529)	Level 2 (included)	Level 2 (included)	Level 2 (included)
Drivers and Software						
Client drivers available:						
Windows 95: 16-bit/32-bit	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x/Windows NT	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
OS/2 Warp / Mac OS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Server drivers available:						
Windows 95: 16-bit/32-bit	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 3.x/Windows NT	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
OS/2 Warp / Mac OS / Unix	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Printer management utility	HP JetAdmin	MarkVision	Color Network	PhaserLink	PhaserLink	CentreWare DP
Utility runs under:						
NetWare 3.12/NetWare 4.x/Windows NT	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
OS/2 / Mac OS / Unix	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Utility can see different printer brands	■	■	■	■	■	■
Color management support	HP Color Smart, Pantone	AGFA PhotoTone, Apple Colors, Pantone	Windows ICM	Pantone, TekColor	Pantone, TekColor	ICM/ColorSync 2.0, Pantone
Paper Handling						
Rated duty cycle (color pages per month)	30,000	20,000	30,000	20,000	25,000	20,000
Number of standard paper cassettes or inputs	1	2	2	2	2	2
Total standard capacity (input/output, in sheets)	250 / 100	400 / 250	250 / 150	200 / 250	250 / 100	250 / 150
Maximum printable area on letter-size paper	8.2 x 10.7	8.5 x 11.0	8.0 x 10.5	8.1 x 10.5	8.0 x 10.5	8.0 x 10.5
Prints on legal-size paper	■	■	■ (black only)	■	■	■
Prints on transparencies/envelopes	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Heaviest paper stock accepted	24 lb.	90 lb.	90 lb.	80 lb.	80 lb.	24 lb.
High-capacity paper cassette: capacity/price	None	250 sheets/\$479	250 sheets/\$399	500 sheets/\$495	500 sheets/\$495	250 sheets/\$595
Duplexer/sorter/stapler	None	None	None	None	None	None
Hard disk capacity/price	None	840MB/\$499	None	2.1GB/\$595	2.1GB/\$595	810MB/\$520
Cost per page (vendor estimate)						
5 percent black coverage (typical letter)	1.8 cents	2.7 cents	2.2 cents	1.6 cents	2.4 cents	2.5 cents
25 percent color coverage (typical graphic)	7.5 cents	14.0 cents	13.8 cents	13.0 cents	18.0 cents	11.9 cents
100 percent color coverage (full-page photo)	34.0 cents	43.6 cents	55.0 cents	47.0 cents	63.0 cents	30.6 cents
Networking Support						
Standard/bidirectional/C-size parallel port	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
EPP/ECF	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Serial/SCSI/LocalTalk port	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Supports more than one installed network adapter	■	■	■	■	■	■
Type of Ethernet connector	10Base-T, 10Base2	10/100Base-TX	10Base-T	10Base-T, 10Base2	10Base-T, 10Base2	10Base-T, 10Base2
Card supports IPX/SPX and TCP/IP	■	■	■	■	■	■
Card supports NetBIOS/NetBEUI/EtherTalk	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
List price of Token-Ring adapter	\$619	\$599	\$699	\$895	\$895	\$620
Service and Support						
Toll-free technical support	■	■	■	■	■	■
Warranty	1 year	1 year	1 year	1 year	1 year	1 year
Technical-support hours (eastern time)	6:00 A.M. - 10:00 P.M. M-F, 9:00-4:00 Sat., www.hp.com	9:00-9:00 M-F, Noon-6:00 Sat., Sun., www.lexmark.com	24 hours, 7 days www.minoltaprinters.com	9:00-8:00 M-F www.tek.com/Color_Printers/	9:00-8:00 M-F www.tek.com/Color_Printers/	9:00-6:00 M-F xerox.networkprinters.com
Web address						



Introducing Kayak from HP. The world's fastest PC Workstation.

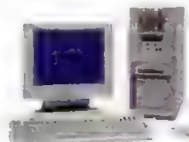
It isn't merely fast. It has *twice* the graphics performance of Sun's™ Ultra™2 UNIX® Workstation. (At nearly half the price.) And twice the graphics performance of any Intel-based machine. In fact, Kayak is a whole family of PC Workstations, starting at under \$3000.* They have features you won't find



Kayak XU

on much more expensive machines.

Like AGP graphics and FastRAID



Kayak XA

SCSI accelerators.* Imagine rendering 3.4 million 25-pixel triangles per second. Imagine getting home on time for a change. But we're not just a leader in speed; we're the leader in Windows® NT PC Workstations. And don't forget our NT/UNIX interoperability backed by our strong UNIX heritage. Of course we could go on, but you've been waiting long enough. For a quick Kayak preview, visit www.hpresource.com/kayak



Tell your CEO PCs with the

AMD-K6™ MMX™ Enhanced Processor give you
the power to beat the competition.

Performance enthusiasts and cost controllers, rejoice. No matter how much or how little you want to spend on a Microsoft Windows® compatible PC, you'll get higher performance from a system based on the AMD-K6™ MMX™ Enhanced Processor. Check out the stats: blazing 233 MHz clock speed. Eye popping multimedia capability. And sound quality even an audiophile will love. An AMD-K6 based system is more than an alternative to a Pentium® II based PC. It's the one that gives you more alternatives. Because with the money you save, you can get twice as much memory. A better video card. Better audio. And a faster modem. In short, AMD-K6 based systems give you more performance (CEO will approve) for the same money (CFO will approve). To get the rest of the story, hit our web site (you will approve).

AMD

www.amd.com

CIRCLE 079 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink



Tell your CFO it's a responsible fiscal decision.

Dream Machine.
Not The Bike. The Digital Color Copier.



A Digital Color Copier For Every Department. Every Company. \$14,895.

Digital Color + Productive B & W
Converts to network printer-scanner
Unique optional embedded Fiery
Prints up to 11 X 17 format



Aficio Color 2003



Spectacular color every office can afford. Don't send out for expensive copies. Experience the productivity of easy, smart digital features for thousands less. Get a demo of your colorful future from the #1 maker of digital copiers in the USA. Call 800 63 RICOH. Online www.ricoh-usa.com

RICOH
Image Communication

CIRCLE 205 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

for the Phaser 350, making it more attractive for mixed color and monochrome environments.

On our tests, the Phaser 350 produced brilliant colors, crisp edges, fully filled-in solid areas, and gradients without banding. Photos showed a grainy effect from dithering but were certainly acceptable for business documents. Text was suitably crisp. Although Tektronix rates the Phaser 350 at 6 ppm for 300 by 300 dpi, and at 4 ppm for 600 by 300 dpi, it was one of the slowest printers on our tests. Even so, it still makes a reasonable choice as a low-budget laser equivalent.

Last year's Phaser 550 was the laser printer to beat. This year's Phaser 560 raises the bar on quality and features while, at the same time, lowering the price. The extended version that we tested includes 40MB of RAM and boosts resolution to 1,200 dpi.

Setting up the Phaser 560 isn't as easy as the 350, but it's far easier than with most laser printers, consisting of little more than plugging in the cables, loading four toner cartridges, and installing the software. More important, the claimed 12,000 pages per cartridge for the black toner, and 10,000 pages for color mean you won't have to change cartridges very often.

The output quality is impressive. Graphics offer crisp edges, solid thin lines, and smooth gradients with only a hint of banding on the toughest test images. Photos are close to true photographic quality—closer indeed than any color laser printer has come thus far. And text is as sharp and well delineated as you would expect from any monochrome laser printer.

In addition, the Phaser 560 was one of the best performers on the tests that we ran at 600 by 600 dpi. It did slow down a bit, however, on our 1,200- by 1,200-dpi tests—especially in Photoshop when printing a high-resolution version of the test file.

All told, these two printers from Tektronix make an admirable pair. The Phaser 350 is a good color laser equivalent for the budget-conscious business market,



The Tektronix Phaser 560, our Editors' Choice, is the color laser printer to beat. The solid-ink Phaser 350 is also a good choice.

while the Phaser 560 combines top-notch output quality with speed at a reasonable price.—MDS

Tektronix Inc., Wilsonville, OR; 800-835-6100, 503-682-7377; www.tek.com/Color_Printers. Circle 444 on reader service card.

Xerox DocuPrint C55mp

SPECIFICATIONS: Legal-capable laser printer; 12 ppm monochrome, 3 ppm color.. Resolution: 600 dpi. Input capacity: 250 sheets standard, 500 sheets maximum. Tested configuration: \$4,780 street.

Xerox Corp.'s new color laser printer is aimed at business users who don't necessarily know anything about color output but want a single printer for both color and monochrome. With the DocuPrint C55mp, the vendor hits this target surprisingly well.

Configuring and monitoring the DocuPrint are easy, thanks to Xerox's new software CentreWare Internet Services, a browser-based administration utility that you can access from any PC with a Web browser installed. The utility lets you monitor the status of almost

any printer on your network and configure various parameters for Xerox printers. Noteworthy conveniences include a Hold option that tells the printer to wait before printing, so you can walk to a network printer, load special stock, and

press a button to start the print run. More important are built-in smarts, including an option to analyze an image and optimize the settings.

The output is far better than that of earlier Xerox color laser printers. Graphics offer sharp edges, solid areas of full color, and gradual shading in gradients, though with a bit of banding in PCL mode. Text is a match for any 600-dpi monochrome laser printer. Photos are

slightly grainy in PCL mode, however. PostScript mode adds a 600- by 300-dpi contone choice, with 16 shades for each color and far less obvious dithering—a big step closer to true photographic quality. Speed is generally slow to midrange in PCL mode, but in PostScript mode the DocuPrint is among the fastest of the laser printers.

All told, the DocuPrint C55mp is a more than acceptable choice. Output quality for photos and graphics is not quite up to that of the more-expensive



The Xerox DocuPrint C55mp can deliver near-photo-quality output in its best mode.

Tektronix Phaser 560, but the unit is good enough for most purposes and comes at a lower price.—MDS

Xerox Corp., Rochester, NY; 800-349-3769, 716-422-5133; xerox.networkprinters.com. Circle 445 on reader service card. 

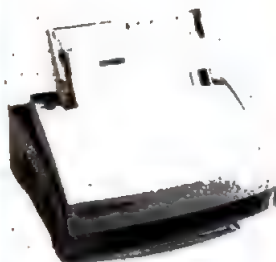


DP-560 Laser Printer

The trustworthy sibling.

True 600 DPI begets professional quality text. 6 PPM, Windows compatible.

\$199*



DP-570 Laser Printer

The nurturing, dependable spouse.

Prints complex charts, graphs and halftones expeditiously. True 600 DPI, PCL6 printing. 6 PPM, Windows-DOS compatible.

\$249*

**The
Functional
Family**

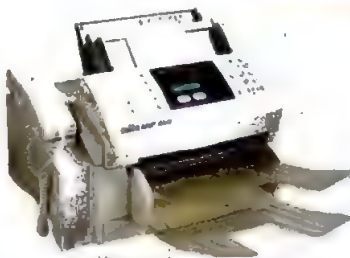


DP-580 Laser Printer

The gifted yet magnanimous sibling.

Very presentable, high-end resolution—1200 DPI class.

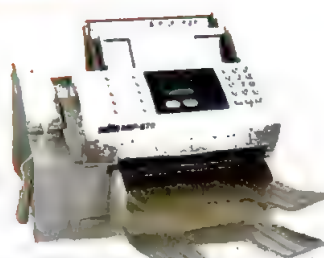
\$399*



MIP-650

The multi-faceted matriarch.

Fax/copy/print/scan in one. True 600 DPI, GDI printing. 6 PPM, Windows compatible. **\$699***



MIP-670

The sage and benevolent grand patriarch.

Fax/copy/print/scan and more. True 600 DPI, PCL6 printing. 6 PPM, Windows-DOS compatible. **\$849***

mita
can help
www.mita.com



* Expected selling price. ©1997 Mita Copystar America, Inc. As an ENERGY STAR® Partner, Mita Copystar America, Inc. has determined that this product meets the ENERGY STAR® guidelines for energy efficiency.

Graphics Printers **Color** For the **PROS**

For the best color output, you need a dedicated color printer. PC Labs tests 15 units that span five color printing technologies. *By M. David Stone*

Graphics-oriented color printers are usually easy to spot. Most need special paper or are noticeably slow for text (or have both of these drawbacks), making them unsuitable for day-to-day monochrome output such as letters. For the few that can handle monochrome business documents (namely ink jets), the giveaway is a tabloid-size capability that most offices don't need.

As a group, users who print graphics fall into one of two categories: graphics professionals whose livelihood revolves around color artwork and others who need the same capabilities occasionally, but not often enough or badly enough to justify paying \$2,000 or more for a printer.

REVIEW CRITERIA

For this overview we cover both categories, including all machines that are new to the market since our last color graphics printer roundup ("A Spectrum of Choices," October 22, 1996) and have a street price (for their base configuration) of under \$15,000. Note that ink jets meant for individual desktops or home use will be covered in our next issue's roundup of personal printers (along with personal monochrome laser printers and personal multifunction printers).

We tested 15 graphics printers that use five different technologies: 5 ink jet printers, from Canon, Epson, Hewlett-Packard, and Tally; 7 thermal dye printers, from Alps, Eastman Kodak, Fargo, QMS, Tally, and Tektronix; 2 thermal wax printers, from Fargo and Tally; 2 solid wax printers, from Tektronix; and 1 printer using Micro Dry technology, from Alps. (The total comes to more than 15 because the Alps and Fargo printers each offer two printing modes.)

The two categories of printers—those targeted at graphics professionals and those targeted at other users—cut across technologies. Note too that you'll find a choice in both categories as far as the maximum paper size accepted by the printer. All of



IN THIS REVIEW

Alps MD-2300	162
Canon BJC-4550	162
Eastman Kodak DS 8650 PS	164
Epson Stylus Color 1520, 3000	164
Fargo Pictura 310e	166
HP DeskJet 1000Cse	170
QMS ColorScript 480	172
Tally T7070, SpectraStar 280, SpectraStar DSx	173
Tektronix Phaser 300X, 380, 450, 480X	178
Editors' Choice	148
Color Output Comparisons: Some Good, Some Better	157
Variable-Dot Technology: A Lifeline for Thermal Wax?	162
Performance Tests	170
Summary of Features	172

www.pcmag.com

How does your printer compare with the professional-caliber machines we looked at for this review? Visit the interactive version of "Color for the Pros" and find out.

It slices. It dices. Makes gorgeous



julienne carrots.

Meet photo-realistic color printing so real, you can taste it. Add in faxing,

copying and scanning, all packed into one simple-to-use, space-age

device, and you've got Canon's MultiPASS™ C3000.



*Photo-realistic
color printing.*

For only \$499*. With its optional Photo Kit, this is the

only true photo-quality product of its



*Plain paper
faxing.*

kind. You get free TextBridge® Classic OCR

and Canon Creative software,** your



*Crisp, convenient
copying.*

key to amazing results, featuring WebRecord™

Internet printing. Operators are standing by.



*400 dpi grayscale
scanning.*

So call us at 1-800-848-4123 or visit www.ccsi.canon.com. Because

now all your printing will be absolutely delicious. **See what we mean.™**

Canon

*Manufacturer's suggested retail price. Dealer prices may vary. **All software available on CD-ROM only and designed for use only with Windows® 95. © 1997 Canon Computer Systems, Inc. Canon is a registered trademark and MultiPASS, WebRecord, PhotoRealism and "See What We Mean" are trademarks of Canon Inc. In Canada, call 1-800-263-1121

the ink jets, most of which are meant for the SOHO market, can print on 11-by-17-inch paper, also known as *tabloid-size* or *B-size*; both Epson units and the Tally T7070 can also handle *C-size* paper, which measures 17 by 22 inches. Three of the thermal dye printers are also tabloid-capable, as are the solid ink units from Tektronix. B-size capability is useful for small posters and the like, but is of most interest to design artists who want to see the facing pages of a magazine-style format.

Most of the printers using other technologies offer *A-size* (letter-size) or *super A-size* capability. Super A-size paper is large enough to print a *full-bleed* A-size image—meaning one that's slightly larger than A-size—and still leave room for crop marks and the like in the margins.

If you're in the market for a graphics printer, output quality issues deserve special mention. Be aware that output of perfect quality isn't always as important as you might assume. A graphics printer isn't always the final destination for what's being printed. The printout may be no more than a reality check for a file that's on its way to a printing press. It may be enough to print *comps*—design compositions that show the layout and let you judge design without worrying about particulars such as precise colors. Alternatively, you may need *proofs*—with colors and layout that look as close as possible to the final product.

INK JETS: SOLID CHOICES FOR SOHO

The five ink jet printers in this overview have street prices of \$500 to \$2,000. All are suitable for printing text as well as color graphics, and can print at least B-size output. The key difference between ink jets aimed at graphics professionals and those aimed at the SOHO and home markets is how often you have to replace their ink cartridges. The Epson Stylus Color 3000, in particular, offers large cartridges with lots of ink, for heavy-duty printing.

With all the ink jets we tested, you'll see saturated colors in graphics and something approaching true photographic quality for

Editors' Choice

High-end: Eastman Kodak DS 8650 PS,
Tektronix Phaser 480X

Low-end: Canon BJC-4550



If you are a graphics professional who needs photographic-quality output, the Eastman Kodak DS 8650 PS is unsurpassed and wins our Editors' Choice.

This letter-capable thermal dye printer produced some of the best continuous-tone output we've ever seen from a printer in this class, and it was easy to set up and use. At \$7,500 (street) the DS 8650 PS represents quite an investment for an A-size printer, but it's worth the price.

If you need tabloid-size photo-quality output, the Tektronix Phaser 480X (\$13,800 street) is the winner. Setup is easy and output quality superb—just behind the Kodak. Tektronix's Phaser 450 (\$7,500 street), an A-size thermal dye printer, also produced fine output at reasonable speeds and merits an honorable mention.

For individual business users or graphic artists on a tight budget, the Canon BJC-4550 is the printer of choice. This \$500 tabloid-capable ink jet is ideal

for solo shops that have to produce an occasional oversize color design comp but can't justify spending thousands of dollars on a printer. Output on plain paper is acceptable for works in progress, and stepping up to premium stock yields stunning results for an ink jet. The trade-off for the low price is speed, but using the BJC-4550 will always be faster than using a service bureau.

The two Epson ink jets in this class deserve honorable mention. The Stylus Color 1520 (\$800 street) and Stylus Color 3000 (\$2,000 street) can print on C-size stock (13 inches by 21 inches, plus bleed), and produce output nearly as good as the Canon at much better speeds. We especially liked the high-capacity ink tanks of the Stylus Color 3000, which make it a better choice than the Canon unit if you print several color-intensive documents per day.

at least some photos. Output quality improves significantly with special paper, which costs about 10 cents per page for coated stock or \$1 per page for glossy paper. You should definitely consider ink jets for final output in a small office or for comps for serious graphics work. One measure of how seriously you can take ink jets is that Lyra Research (a market research firm in Norwood, Massachusetts) projects that 643,000 B-size color ink jets will ship this year, and that that number will grow to more than 2 million units by 2001.

SOLID INK: TWO WAYS TO PLAY

Solid ink printers come in two versions. The Tektronix Phaser 300X sprays melted wax on the page, just as an ink jet sprays liquid ink. The Phaser 380 sprays wax on a drum, then rolls the drum against the paper. Both solid ink versions can print on any paper that will fit through the printer, and both offer more consistent color than do most other technologies. This makes solid ink printers a good choice for color proofing, despite visible dithering. They are particularly useful for printing on the stock you'll use for final output, so you can see the effect of the paper's color on your perception of the image's color.

THERMAL DYE: FOR PROS ONLY

Thermal dye printers are the only ones that offer dither-free output. Base street

Our Contributors: M. DAVID STONE is a contributing editor of *PC Magazine* and the author of *The Underground Guide to Color Printers* (Addison-Wesley Developers Press, 1996). DANIEL GROTTA and SALLY WIENER GROTTA are contributing editors of *PC Magazine*. JON HILL and JAMES KARNEY are frequent contributors to the magazine. JAMIE M. BSALES was the associate editor in charge of this story, and JEFF MACE was the project leader.

COVER STORY
Color Graphics Printers

prices for this year's batch range from \$750 to \$7,500 for A-size machines and from \$5,000 to \$13,800 for B-size units. Thermal dye printers hold a ribbon against the paper and apply heat, so that dyes in the ribbon diffuse into a polyester coating on the paper. The heavy polyester coat gives the paper the look and feel of a glossy photo, which makes thermal dye printers particularly appropriate for digi-

tal photographic output. They also handle graphics well, with saturated, brilliant colors, and their high quality makes them favorites for in-house proofs.

Note that the steep cost of entry and the high price per print—\$2 to \$3 each for A-size prints, and \$4.95 to \$6.70 each for B-size—make for high operating costs that limit this technology's appeal for graphics pros and service bureaus. Lyra

Research projects that just 136,000 thermal dye printers will ship this year, and that the number will grow only slightly—to 167,000—by 2001.

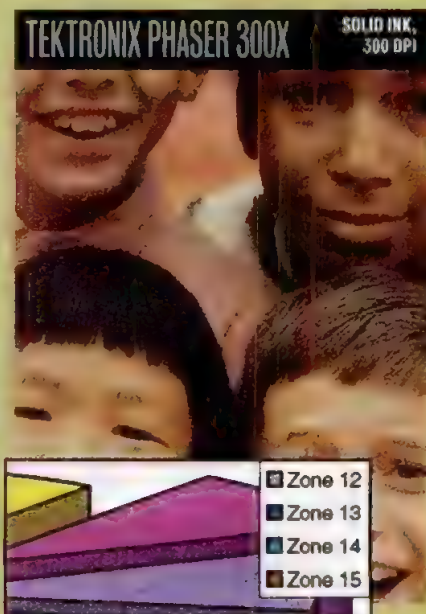
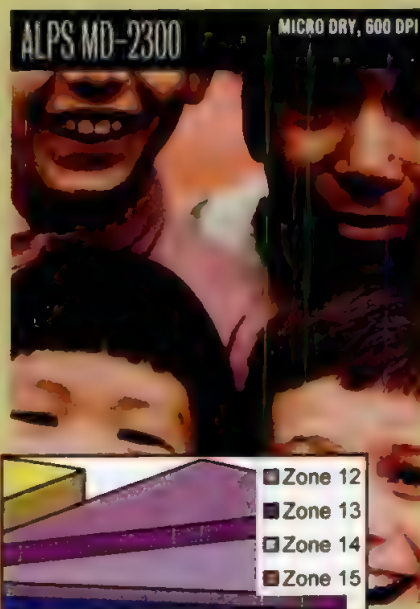
THERMAL WAX: A SHRINKING NICHE

Thermal wax technology is similar enough to thermal dye that some printers—including Fargo's Pictura 310e—offer both. With thermal wax printing, however, the

Color Output Comparisons: Some Good, Some Better

The true test of a color graphics printer is how well it reproduces true-to-life photo output. Clearly, continuous-tone thermal wax printers have the advantage in color reproduction, with the bluest show ribbon going to the Eastman Kodak DS 8650 PS (with a nod as well to Tektronix's outstanding Phaser 450 and Phaser 480X). But these printers' high prices (\$5,800 to \$13,800), slow speeds, and high per-page costs make thermal dyes appropriate only for prepress proofing and photo reproduction.

If you are a business user or graphic artist with more modest needs (and means), consider one of the ink jet printers. Output from the Canon BJC-4550 is stunning, and that from the Epson Stylus Color 3000 is almost as good. The solid ink entries from Tektronix also produced good results. The output of the thermal wax Tally SpectraStar 280 reveals the flaws of the technology, with obvious dithering.



Color Graphics Printers

ribbon carries wax that melts and is transferred to the paper, which is either coated paper or standard paper onto which the printer ribbon also places a coating.

Traditional thermal wax printers, like Tally's SpectraStar 280 or the Fargo Pictura 310e in wax mode, offer brilliant colors and crisp edges, but with highly visible dithering patterns. They are well suited to overhead transparencies, but are a

poor choice for most other applications.

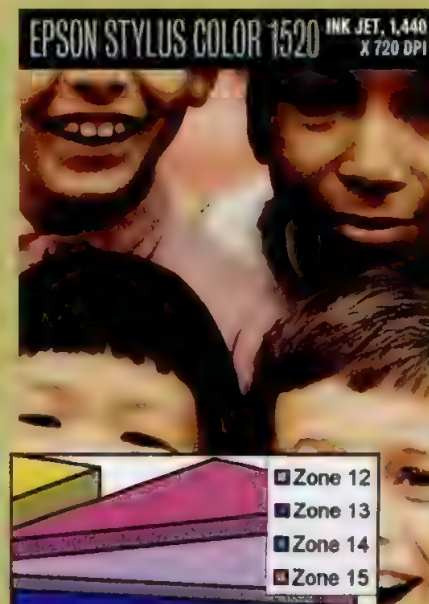
A new variation of thermal wax printing, represented by Tally Printers' Spectra-Star T8050 (see the sidebar "Variable Dot: A Lifeline for Thermal Wax?"), uses variable-dot technology to print in 64 shades for each primary color to minimize dithering. This new approach may revive this technology. Note, however, that Lyra Research projects thermal wax sales to be

even lower than thermal dye sales: It projects that 125,000 printers will be shipped this year, and that this number will fall to 93,000 by 2001.

MICRO DRY: A LITTLE TOO LATE?

Micro Dry—a proprietary technology developed by Alps Electronic (USA)—is similar to the thermal wax process, except that it uses resin-based inks instead of wax. It

Color Output Comparisons: Some Good, Some Better



Color Graphics Printers

also produces better-looking output, with less obvious dithering patterns. Alas, the technology may have missed its window of opportunity. Although Micro Dry quality was impressive compared with ink jet output when it first came out, today's ink jets have surpassed Micro Dry, with lower costs for both purchasing and operating.

When comparing these printers, keep in mind that for graphics printers, raw perfor-

mance is often less important than how well they meet the task at hand—whether it is providing comps, proofs, or final output. For comps and proofs, in particular, your other choice is to wait for a service bureau, so even a slow printer will save you time.

Not surprisingly, almost all of these printers offer PostScript Level 2, either built in or, for most ink jets, as an optional interpreter that runs on your computer.

PostScript is important if you want to print comps or proofs for files you will hand off to a service bureau, since it ensures that the layout won't change in the final product.

This year's crop of graphics printers covers lots of territory, from the under-\$500 SOHO printer to the nearly \$15,000 professional-level printer. Somewhere in that range, you should find the right mix of technology, price, and performance.



**Bells, whistles and a little something
to silence the competition.**

SATISFACTION HP IS UNSURPASSED IN OVERALL SATISFACTION

Given that HP ranked at the top in both vendor reputation and service and support, it'd come as no surprise that HP excelled in overall satisfaction in the notebook market. Based on a scale of 1 to 5, where 1 is "not at all satisfied" and 5 is "completely satisfied," HP garnered the top score of 4.27 from 1,651 managers who purchase desktop systems.

1997 NOTEBOOK SURVEY RESULTS

	SERVICE AND SUPPORT	REPUTATION
HP	3.96	4.27
DELL	3.81	4.10
IBM	3.65	4.00
TOSHIBA	3.48	3.94

HP achieves highest rank among notebook vendors

	HP	DELL	IBM	TOSHIBA
VENDOR REPUTATION	4.27	4.10	4.00	3.94

Support grades show that users don't necessarily sacrifice service by choosing direct sales. HP's grade of 3.96 is higher than Dell's 3.81.

You've decided what you want in a notebook. But before you decide which one to get, consider that in a recent customer survey by *Computerworld*,

HP OmniBook 5700
*The power of your
desktop, anywhere.*



HP was ranked at the top in overall satisfaction among 1,651 IT buyers of notebook computers. Perhaps that's because



HP OmniBook 800
*Ultra light, ultra high
performance.*

HP's entire family of OmniBooks was unsurpassed in the survey when it came to service and support, vendor comfort and reputation. Couple that with

the fact that HP scored significantly above average in every other category in the survey, and a certain something begins to ring true. From the value-priced

OmniBook 2000, to the lightweight 800 model,



HP is being recognized as a leader

in notebook computing across

the board. Well, that certainly sounds like loud praise indeed.



HP OmniBook 2000
*Everything you expect from a
high-performance notebook,
except the price.*

Drop by our quick link: www.hpresource.com/omnibooks



Variable-Dot: A Lifeline for Thermal Wax?

In their heyday, thermal wax printers were the choice for high-quality business output for reports, presentations, and transparencies. With shared high-quality ink jets and color laser technology not even a blip on the horizon, the grainy dithering of thermal wax was forgivable. But with the other technologies coming into their own, thermal wax seemed destined to go the way of the daisy wheel.

But it's not dead yet. Mitsubishi, one of the leading makers of print engines for thermal wax and thermal dye printers, has perfected a new engine that boosts the quality of thermal wax prints significantly. The new variable-dot technology debuts in Tally Printers' SpectraStar T8050 (\$11,400 street), targeted at ad agencies and graphic designers. We were

able to test a late-beta version of the printer informally, and we were impressed.

Until now, all thermal dye and thermal wax units have had fixed dot patterns, in which all dots are the same size and are placed at evenly spaced intervals, usually every 1/300 inch (for 300-dpi resolution). The T8050 is still a 300-dpi unit, but it can create up to 64 different sizes for each dot. The printer can also place dots closer to or farther from one another, to allow for dense or sparse clustering. This combination of variable sizing and clustering allows for sharper, cleaner edges, and can even produce output that approaches the

image quality of continuous-tone thermal dye printers.

Variable-dot technology also has an advantage over the thermal dye process in operating costs. A tabloid-size thermal dye print typically costs almost \$7 per print, while the T8050's variable-dot output averages about \$3.75 per page on the special paper required, or just \$1.65 in standard thermal wax mode.

A genuine innovation that brings prices down as well, variable-dot technology may breathe new life into the flagging thermal wax arena. (Tally Printers Inc., Kent, WA: 800-426-4813, 425-251-5524; www.tally.com. Circle 452 on reader service card.)—DG & SWG



The Alps MD-2300 is an inexpensive continuous-tone printer, but you may be better served by an ink jet.

Alps MD-2300

SPECIFICATIONS: 3-ppm legal-capable four-color Micro Dry/thermal dye printer. Resolution: 600 dpi standard, 1,200 by 600 dpi maximum. Tested configuration: \$750 street.

The Alps MD-2300 is an easy-to-use printer for graphics pros who need an inexpensive thermal dye device for layout comps and other in-house work. Though the price is attractive compared with the \$5,000 or more that traditional thermal dye units cost, the trade-off comes in speed and output quality; today's ink jets offer competitive quality for much less money.

The MD-2300 is a dual-mode printer, delivering both thermal dye output and

Alps's unique Micro Dry technology, which transfers solid color ink onto Mylar tape before setting the ink against the paper. The MD-2300 can also generate thermally applied metallic ink colors for attention-grabbing signs and postcards.

At the heart of the MD-2300 are its half-inch-wide, typewriter-style CMY, CMYK, and metallic ribbon cartridges, which snap easily into place. The printer warns you when a specific ribbon is empty, so you won't have to replace an entire spool when a single color runs out.

Print quality is generally adequate, but we also found it unpredictable and difficult to control. The ribbon cartridges invariably emboss telltale half-inch bands on the paper, scarcely noticeable on Alps's postcard-size media but highly visible and distracting on letter-size paper. During our tests, we saw significant banding in the gradients and the colors seemed somewhat thin.

In order to keep prices low, the MD-2300 has only 32K of memory, relying instead on the host PC for image processing. This can significantly affect foreground tasks, as you wait for the printer to finish. In thermal dye mode, the MD-2300 took a long 16 minutes 45

seconds to produce our Freelance Graphics file and an interminable 21 minutes 47 seconds for the Excel for Windows file, though its time on our Adobe Photoshop test (9 minutes 10 seconds) was better than that of the other thermal dye printers we tested. Micro Dry print times were more reasonable, making it the mode of choice for drafts and works in progress.

Although the Alps MD-2300 is an interesting device, it is likely to disappoint most users. Photo-realistic ink jets cost hundreds of dollars less and can produce better prints in less time.—Daniel Grotta and Sally Weiner Grotta

Alps Electric (USA) Inc., San Jose, CA; 800-825-2577, 408-432-6000; www.alpsusa.com. Circle 446 on reader service card.

Canon BJC-4550



SPECIFICATIONS: 2-ppm tabloid-capable four-color ink jet printer. Resolution: 360 dpi standard, 720 by 360 dpi maximum. Tested configuration: \$500 street.

If you're a budget-conscious business user or a graphics pro in a one-person shop and you only need occasional tabloid-size color output, you can't do much better than the Canon BJC-4550. Not only does this ink

**NEW
PRODUCT**



The New HP NetServer LXr Pro and Rack Solution

Intel Pentium Pro 200 MHz processor with 512KB cache and up to four-way multiprocessing

Also available in 1MB cache versions

HP NetRAID PCI Disk Array Controller with three Ultra SCSI channels,
connects up to eight drives per channel

Up to 10 I/O slots: six bus master PCI, four EISA (one EISA slot reserved for system)

LAN Support and Comprehensive Network Support available as HP SupportPack

128MB/512MB ECC memory expandable to 4GB

Three hot-swap Redundant Power Supply standard

Fastest four-way.* Over 1TB of storage.

Let's get ready to Rack.

www.hpresource.com/racks

*Based on benchmark numbers of 9,198 TPM. The Intel Inside logo and Pentium are registered trademarks of Intel Corporation. ©1997 Hewlett-Packard Company

Color Graphics Printers

jet printer offer a bargain price for a B-size unit, it takes up only a little more desk space than regular A-size ink jets. It's no speed demon, but output quality is good enough for business graphics, brochures, design comps, and workhorse monochrome printing.

Setup consists of plugging in the cables and ink cartridges and installing the software. An Adobe PostScript Level 2 interpreter is available for \$99 (list), though we tested in native mode. There is no network support.

Output quality depends on what paper you use and how you tweak the settings. With the default settings for plain copier paper, edges are acceptably crisp, fine lines are solid, colors are reasonably saturated, and text is dark and well formed. Banding in gradient fills and dithering are appropriate for a 360-dpi ink jet.

Switch to high-resolution paper that costs ten cents per sheet, photo ink, and high-quality resolution (720 by 360 dpi), and colors are brilliant, dithering all but disappears, and banding becomes far less objectionable. Photo printouts lack subtle shading, however, giving them a slightly flattened look.

Speed is less impressive: The BJC-4550 came in last among the ink jets on every test. It took more than 10 minutes to produce our three-page Freelance Graphics test file, or about five times as long as the average time of the other ink jets we tested. Note also that because the image processing takes place at the computer, it slows your system down for other tasks while printing.

But if you only need tabloid-size prints

occasionally, giving up speed is not such a bad compromise for this level of output quality at such a reasonable price.—*M. David Stone*

Canon Computer Systems Inc., Costa Mesa, CA; 800-848-4123, 714-438-3000; www.ccsi.canon.com. Circle 448 on reader service card.

Eastman Kodak DS 8650 PS



SPECIFICATIONS: .7-ppm letter-capable thermal dye printer. Resolution: 300 dpi. Tested configuration: \$7,500 street.

Kodak's versatile DS 8650 PS is a first-rate thermal dye color proofer suitable for the most demanding prepress and professional photography markets. Reasonably fast, with stunning output quality, it's a perfect fit for its high-end audience. It's more expensive than other letter-size thermal-dye printers, but well worth the extra cost.

The DS 8650 PS is a workhorse that can crank out up to 50 prints an hour, thanks to its Raster mode (which can be used via the standard parallel or SCSI ports, or a \$995 Ethernet connection). The printer offers ICC, Eficolor, and Pantone color-matching systems, plus the ability to create custom color profiles. Kodak also offers an Xtralife CMY ribbon, whose laminate protects your prints from the effects of fingerprints and fading.

Setup was quick and virtually automatic. The printer cover swings up for easy ribbon installation, and navigating the control panel is fairly simple. One annoyance: If you're in the wrong mode (PostScript as opposed to Raster, for example), you won't see an error code—the unit just won't print. You'll find, however, that most normal printing procedures are easy and trouble-free.

Print output from the DS 8650 PS is among the best we've seen from a thermal dye printer. Colors are rich and well saturated, with good detail in both shadow and highlights. Registration and thin-line reproduction are superb, and continuous-tone gradients display no banding whatsoever. Blacks are crisp and dark, but

CMYK blacks are marginally though not significantly darker than CMY blacks. (CMYK output, however, requires a minimum of 48MB of RAM.)

The Kodak machine was faster on our speed tests than the other thermal dye units. It posted the best times on the Freelance Graphics, Microsoft Excel, and Freelance Transparency tests, beating the average time among our tested printers by several minutes per print.

If you need fast, high-volume output for top-quality photo, illustration, and DTP prints, the Kodak DS 8650 PS is the pick of the litter.—*DG & SWG*
Eastman Kodak Co., Rochester, NY; 800-235-6325, 716-726-7260; www.kodak.com. Circle 447 on reader service card.



The Kodak DS 8650 PS produced the best output we've seen from a printer in its class.

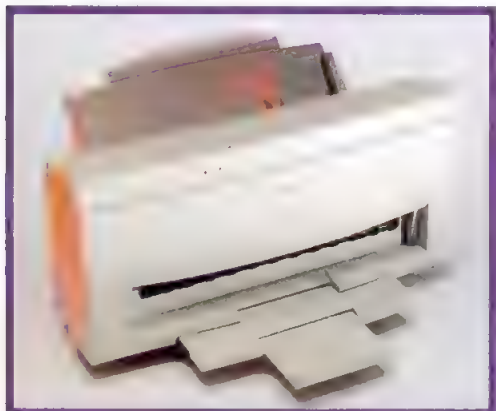
Epson Stylus Color 1520, Stylus Color 3000

STYLUS COLOR 1520 SPECIFICATIONS: 5-ppm tabloid-capable four-color ink jet printer. Resolution: 360 dpi standard, 1,440 by 720 dpi maximum. Tested configuration: \$800 street.

STYLUS COLOR 3000 SPECIFICATIONS: 7-ppm tabloid-capable four-color ink jet printer. Resolution: 360 dpi standard, 1,440 by 720 dpi maximum. Tested configuration: \$2,000 street.

Epson America's Stylus Color 1520 and Stylus Color 3000 offer impressive, high-quality output at workhorse-level speeds. The Stylus Color 1520 is designed for budget-minded business users; the Stylus Color 3000 is better for heavy-duty professional graphics.

The Stylus Color 1520 is meant for relatively light work such as adding color to large spreadsheets; in fact, the color cartridge (\$27) ran out twice dur-



The Canon BJC-4550 is no speed demon, but it's ideal for graphics pros on a budget.



The new Intel® Pentium® processor-based HP Vectra V and X Series PCs* for Business have the capability to remotely and simultaneously power-on PCs in switched-off, standby or sleeping mode and turn them off again.

HP Vectra V and X Series PCs include all the hardware and firmware modifications necessary to implement HP NightDIRECTOR, 1997 EPA ENERGY STARSM award winner.

Works over a LAN or WAN running IP or IPX.

FROM \$992†

You're in Chicago. Your PCs are in Dallas.
Time to power them on.

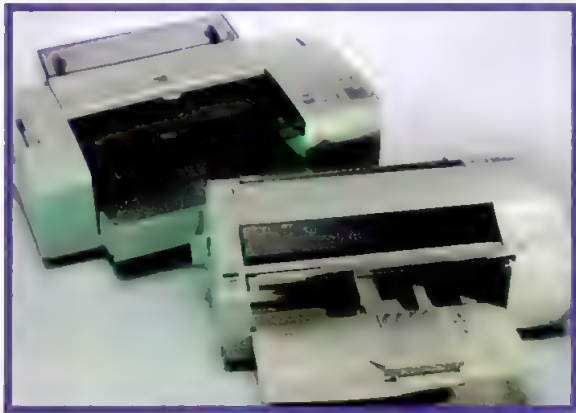
Find out how at our quick link: www.hpresource.com/vectra-8

*Select V and X Series PCs only. ENERGY STAR is a U.S. registered service mark of the U.S. Environmental Protection Agency. †Starting U.S. street price for HP Vectra VE Series 3. Monitor not included. Price includes HP DeskDirect J3239A LAN adapter card. The Intel Inside logo and Pentium are registered trademarks of Intel Corporation. ©1997 Hewlett-Packard Company PPG439



ing our tests. Like other ink jets, output quality varies with the kind of paper and the mode you use. For graphics, copier paper and the 360-dpi default setting yield colors that are less than fully saturated, with some obvious dithering. But thin lines are solid, and gradients change smoothly. When printing photos on either coated paper (12 cents per page) or glossy paper (\$1.80 per page), the Stylus Color 1520 is capable of producing what could pass for photographic-quality output.

On our speed tests, the Stylus Color 1520 was second only to the Stylus Color 3000 among tested ink jets. Note that because the computer handles the process-



The Epson Stylus 1520 and Epson Stylus 3000 deliver fine ink jet prints at very good speeds.

ing, foreground tasks slow down noticeably while printing. Still, the Stylus Color 1520 will provide you with reasonably good-looking output at better-than-expected speeds.

The Stylus Color 3000 is best understood as a heavy-duty version of the Stylus Color 1520, with a tighter focus on graphic artists' needs for comps of color layouts and other artwork. One noteworthy difference is a separate high-capacity cartridge for each color ink. Output quality is essentially the same as with the Stylus Color 1520, except that in the default 360-dpi mode, solid colors showed bands of varying saturation on our tests.

On our performance tests, the Stylus Color 3000 was slightly faster than its lower-priced sibling, which makes it the fastest ink jet in this roundup. As with the Stylus Color 1520, foreground tasks slow down noticeably during printing.

Still, the combination of high-quality output, relatively low initial cost for a tabloid-size printer, and reasonably fast performance makes this a more-than-acceptable choice, and the high-capacity ink cartridges make it particularly appropriate for anyone who prints more than a few pages a day.—MDS

Epson America Inc., Torrance, CA; 800-463-7766, 310-782-0770; www.epson.com. *Circle 449 on reader service card.*

Fargo Pictura 310e

SPECIFICATIONS: 0.25-ppm tabloid-capable thermal wax/thermal dye printer. Resolution: 300 dpi. Tested configuration: \$5,000 street.

Fargo Electronics' no-frills thermal wax/thermal dye dual-mode printers will appeal to graphic designers, photographers, and business users for whom low initial cost is paramount. The tabloid-capable Pictura 310e we reviewed, like the letter-size PrimeraPro Elite (\$1,995 street) that we saw in a late beta version, sells for roughly one-third the price of comparable professional graphics printers. Both machines deliver acceptable-quality proofs and photo-realistic prints and offer

thermal wax modes so you can print out works in progress more cheaply than you could in thermal dye mode. Some users, however, will be frustrated by hardware incompatibilities and slow output speeds.

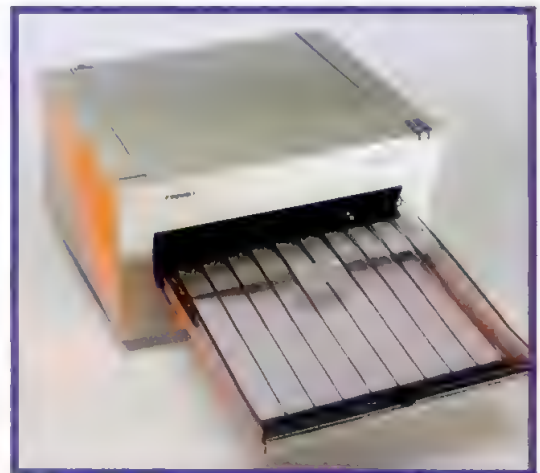
The Pictura can output over-size CMYK and CMY prints, as well as CMY prints with a fade-resistant protective overlay (called PhotoShield) for durability. It comes with PostScript Level 2 software and is compatible with Macintoshes and PCs. It has no network port, however, and Fargo warns that parallel printer cables longer than 6 feet may cause data dropouts.

Setup was fairly simple and trouble-free, though the bundled documentation provided only the most basic troubleshooting aids and very little technical informa-

tion. The Pictura's software was also problematic. Fargo claims that the unit prints significantly faster than earlier models because of its 32-bit spooler. We were unable to verify this, however, because the spooler refused to function with any of our test machines. Fargo told us that it requires a DMA-enabled, ECP parallel port setting, which systems running certain versions of the Phoenix BIOS do not support. Nor could we use Windows 95's own spooler: It repeatedly produced a transmission error that caused data dropouts. The only way we could output was to select the direct print-to-port option without using the Win 95 driver, which left us unable to access our computer during printing.

The Pictura 310e produced good-quality photo-realistic prints, although it lacks halftoning and screening options. It also did not correctly interpret our Freelance Graphics file, consistently dropping the blue background. While type is crisp and well defined, unless the intensity is turned all the way up, the Pictura 310e has great difficulty in printing fine horizontal lines. It generally trailed other thermal dye printers on our performance tests.

We also looked at a late-beta version of the low-cost, letter-size PrimeraPro Elite, which replaces Fargo's PrimeraPro dual-mode printer (a past Editors' Choice winner), though we did not subject it to our full battery of tests. Like the Pictura, the Elite produces three- and four-color thermal dye or thermal wax prints, as well as PhotoShield-laminated prints. We



The Fargo Pictura 310e is one of the least expensive tabloid-size thermal dye printers you can buy.



The HP 300 Series Palmtop PC¹

Featuring the widest screen so you can view information like you would on your desktop PC

VGA wide screen: 640 x 240 pixels

Direct print capabilities through an infrared connection

Wireless e-mail and Internet access via Type II PC Card Modem*

Fast and easy synchronization with your desktop PC

From \$499¹

The problem with most handheld PCs is that the screen isn't wide enou

To get the whole picture, see our quick link: www.hpresource.com/palmtop-3

*Optional accessory available at additional price. ¹Projected U.S. street price. Microsoft and Windows CE are U.S. registered trademarks of Microsoft Corporation. ©1997 Hewlett-Packard Company. PPG450



Never
T
miss a beat.



**Presenting the ultra-reliable
Aquila™ HS/6 for Windows NT®.
Because when the work must
go on, so must your system.**

As Windows NT gains more importance in
your organization, you may find yourself asking:

"Can I really depend on this thing?"

With an Aquanta HS/6 server, the answer
will be music to your ears. Especially once you
hear all the fail-safe features it offers for
mission-critical computing.

For example, how it's equipped with
immediate failure protection, should any
CPU even begin to falter.

Redundant fans and
AQUANTA
power supplies that don't require shutdown
for replacement. And RAID technology that
vigorously protects your data.

What's more, the Aquanta HS/6 runs up to
six Intel Pentium® Pro processors. So you can
maximize system availability in a clustered
environment, while giving users extra power
with its extra CPUs.

Plus everything is backed by the same
worldwide staff of enterprise experts that 41 of the
top 50 banks and 16 of the top 25 airlines rely on.

Sound interesting? Bang out on your keyboard:

www.aquanta-systems.unisys.com

UNISYS

When information is everything.



AQUANTA HS/6 SERVER

Engineered for maximum
availability, the HS/6 offers

up to six 200 MHz

Pentium Pro processors.

Dual peer PCI/EISA bus.

Six RAID-ready bays. 12 slots.

And up to 4GB ECC memory

and 512KB L2 cache.

Plus VisiNet-II systems
management software.

Rackmount also available.



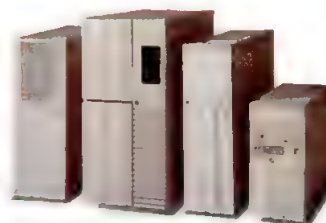
AQUANTA XR/6 SERVER

The first enterprise server
for Windows NT with up to
ten 200 MHz Pentium Pro
processors. High-

performance system bus.

Up to 8GB ECC memory and
20MB L3 cache. Internal
RAID. Hot-pluggable drives,
power and cooling.

And VisiNet-II systems
management software.



AQUANTA DEPARTMENT SERVERS

Servers with one processor
to up to four 200 MHz

Pentium Pro processors.

Rackmount available for dual
and quad systems. VisiNet-II
systems management
software. Perfect for print,
file server and LANs.

www.aquanta-systems.unisys.com

CLICK HERE

to find out about our full line
of Aquanta products.

CIRCLE 008 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

PERFORMANCE TESTS

Color Graphics Printers



If you need a color printer to produce comps reasonably quickly, consider an ink jet; ink jets are the fastest of the lot. If you need true photographic quality, then thermal dye is the right choice, though the print times are often 10 minutes or more.

What the Numbers Mean

Ink Jet Printers There were no surprises in the performance results for this group of dedicated color graphics printers. On every test (other than the Adobe Photoshop and Freelance Transparency tests), the Epson Stylus Color 3000, the Epson Stylus Color 1520, and the HP DeskJet 1000Cse lined up in first, second, and third place, respectively. The Tally T7070 nearly tied for third in one case; all four of these ink jets matched their claimed speeds and emerged in the expected order.

The Canon BJC-4550 ink jet was slower than the Tally T7070, despite a faster claimed speed, because we followed Canon's suggestion and ran all tests with the unit's "fine point sharpening" feature turned on. Although this improved output quality significantly, it took a toll on performance.

Results on our Freelance Transparency tests were less predictable, in part because ink jet printers need to take extra time waiting for inks to dry when printing transparencies. To calculate how long a given printer waits, you can simply compare the results for the Transparency test with the results for the Freelance Graphics test, which uses the same file. For example, the HP DeskJet 1000Cse printed the presentation slides to paper in just 2:40 but needed almost 10 minutes to print the same three pages to transparency film.

On the Adobe Photoshop test, the chief factor in determining speed was the change—or lack of change—in the resolution and other quality settings for each printer. The resolution for the two Epson printers, for example, goes from 360-by-360 for normal graphics to 1,440-by-720 for photo mode. This was the largest jump for any of the dedicated color printers, and it helps explain why the two printers slipped in the speed rankings on this test.

found the same 32-bit spooler and Freelance file problems as with the Pictura.

In thermal dye mode, photo-realistic output appeared sharp and well saturated. But thermal wax prints were suitable only for draft work, as they were mottled and blotchy, and colors were washed out and almost posterized. Still, the PrimeraPro Elite is inexpensive, and for individual graphics users who need true continuous-tone output, it is well worth a look.

If you need a larger printer for tabloid output, you might consider the Pictura

310e. If you can survive the configuration hassles, you'll have a bargain-priced professional graphics printer.—*DG and SWG*

Fargo Electronics Inc., Eden Prairie, MN; 800-258-2974, 612-941-9470; www.fargo.com. Circle 450 on reader service card.

HP DeskJet 1000Cse

SPECIFICATIONS: 3.5-ppm tabloid-capable four-color ink jet printer. Resolution: 600 dpi. Tested configuration: \$500 street.

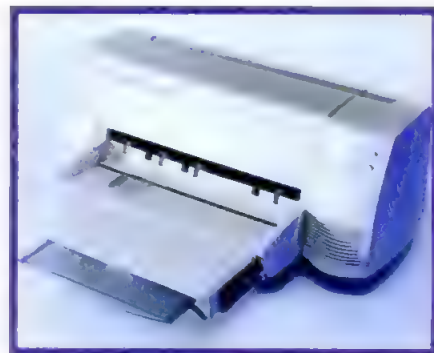
The HP DeskJet 1000Cse is designed for small businesses that need a light-duty,

Thermal Dye Transfer Nearly all of the printers performed as their companies' specifications promised on the Microsoft Excel and Freelance Graphics tests. The tabloid-capable (also called B-size) thermal dye printers ranked in precisely the same order as their rated speeds, while the letter-size (or A-size) printers ranked in almost the same order. The exception was the Eastman Kodak DS 8650 PS, which won top honors for speed, outdoing the Tektronix Phaser 450 and the Tally SpectraStar DSx despite their faster ratings. The Kodak printer's advantage came partly from its 33-MHz processor and partly from the fact that we tested the unit with a three-color ribbon, not the four-color kind we used for the others (Kodak does offer a four-color ribbon, but it was not available to us in time for testing).



The Adobe Photoshop test produced a dramatically different speed ranking among thermal dye printers. Two of the three fastest on the Photoshop test turned out to have the slowest engine ratings (and the slowest results on the other tests): the Alps MD-2300 and the Fargo Pictura 310e. This is not as surprising as it may seem; PostScript offers a speed advantage for vector-based graphic output, as opposed to the bitmapped photographic images printed from Photoshop. By contrast, GDI (graphics device interface) printers use the host computer's processing power rather than their own internal processor, and hence have an advantage when printing bitmapped data. Both the Alps and Fargo units are GDI printers, while every other thermal dye printer in this roundup runs in Level 2 PostScript. So when printing from Photoshop, the PostScript printers should—and indeed do—have slower-than-average performance, while GDI printers are faster. The one exception is the PostScript-based Tektronix Phaser 450, which came with a Photoshop-specific plug-in.

Other Technologies Other tests emphasizing specific modes and technologies generated the expected performance results. The Fargo Pictura 310e was significantly faster in thermal wax mode than in thermal dye mode; the Alps MD-2300 was significantly faster in Micro Dry mode than in thermal dye mode; and Tally's thermal wax PostScript printer was the fastest dedicated



The HP DeskJet 1000Cse is a good choice for businesses that need an oversize color printer.

color printer on everything but the Photoshop test. The two solid ink printers were among the fastest in the group, with the Tektronix Phaser 380 offering the fastest time on the Photoshop test.
—Analysis written by M. David Stone

How We Tested

For each printer, we defined a *standard mode* and a *photo-quality mode* based on discussions with the manufacturer. We used the standard mode on all performance tests except the Photoshop test, and we chose resolution settings and other quality settings to match those that users are most likely to select for their printouts. For the Photoshop test, we used photo-quality mode, which made use of the highest settings for quality available for each

printer. We used standard copier paper on all tests.

For our test-bed we used a Micron Millennia Pentium/200 with 32MB of EDO RAM, a 2.1GB Western Digital Caviar hard disk, an 8X Hitachi CD-ROM drive, and a Proteon 1392 Plus Token-Ring network adapter.

The **Freelance Graphics** test prints a three-page color slide presentation containing pie charts, bar graphs, and a bitmapped photo image on a gradient-filled background.

The **Adobe Photoshop** test prints a one-page photographic bitmapped image.

The **Microsoft Excel for Windows** test prints a two-page spreadsheet with color line graphs, bar graphs, and pie charts.

The **Freelance Transparency** test prints the same pages we used for our Freelance Graphics test, this time on letter-size film.

	Default Resolution Dots per inch	Freelance Graphics Min:sec	Adobe Photoshop Min:sec	Microsoft Excel for Windows Min:sec	Freelance Transparency Min:sec
THERMAL DYE					
Alps MD-2300 (thermal dye mode)	600 x 600	16:45	09:10	21:47	N/A
Alps MD-2300 (Micro Dry mode)	600 x 600	06:41	04:43	06:21	09:09
Kodak DS 8650ps	300 x 300	05:21	11:08	04:17	05:24
Fargo Pictura 310e (thermal dye mode)	300 x 300	15:22	10:46	14:08	N/A
QMS ColorScript 480		08:32	13:52	09:36	08:00
Tally SpectraStar DSx	300 x 300	09:30	15:52	10:30	11:17
Tektronix Phaser 450	300 x 300	07:15	07:44	04:34	08:47
Tektronix Phaser 480X	300 x 300	08:22	17:24	07:40	09:02
SOLID INK					
Tektronix Phaser 300X	300 x 300	06:14	11:25	02:16	06:21
Tektronix Phaser 380	600 x 300	06:30	04:03	02:18	07:50
INK JET					
Canon BJC-4550	360 x 360	10:39	05:54	12:21	10:47
Epson Stylus Color 3000	360 x 360*	01:19	04:43	06:57	02:36
Epson Stylus Color 1520	360 x 360*	01:23	03:27	01:01	04:43
HP DeskJet 1000Cse	600 x 600	02:40	02:46	03:06	09:58
Tally T7070	360 x 360	03:58	04:32	08:16	09:37
THERMAL WAX					
Fargo Pictura 310e (thermal wax mode)	300 x 300	06:51	05:07	07:51	06:42
Tally SpectraStar 280	600 x 300	04:31	11:48	01:10	04:31
		◀ BETTER	◀ BETTER	◀ BETTER	◀ BETTER

* The Photoshop image was printed at 1,440-by-720 resolution.

large-format color printer for brochures, booklets, banners, oversize spreadsheets, and the like. Its solid performance should suit all of your standard business printing needs; graphic artists who need finely detailed or high-volume output should look at the Canon BJC-4550 or Epson Stylus Color 3000 instead.

The DeskJet is rated at 6 ppm in monochrome and 3.5 ppm in EconoFast color mode. It has excellent paper handling for an ink jet device, with a main paper tray that can hold 150 sheets, 50 transparencies, or 15 envelopes. An aux-

iliary tray handles 10 sheets, and a back feeder offers a straight paper path for oversize paper and card stock. Installation was a snap. Excellent software support is provided via a bundled CD-ROM, and the driver lets you resize documents to fill different paper sizes (via a feature called ZoomSmart), with a variety of print options to suit a myriad of special business and marketing purposes. The unit comes with 50 TrueType fonts, and can print from DOS applications under Windows. Note that there is no support for networking other than sharing under

Windows 95, and no support for Windows NT at all.

Output was good for standard business chores, but photos and complex graphics were a stretch. Colors on our business charts and transparencies were rich, with good contrast. Registration was excellent, and the DeskJet produced clean borders between colors and clean thin lines. Black text was clean and full. One disappointment was on our gradient fills, which showed noticeable banding even when using high-quality paper and appropriate settings. For photos, the

SUMMARY OF FEATURES

Color Graphics Printers

INK JET SOLID INK

THERMAL DYE/THERMAL WAX

■ YES □ NO □ OPTIONAL

Products listed in review order

PC MAGAZINE
EDITOR'S CHOICE

	Canon BJC-4550	Epson Stylus Color 1520	Epson Stylus Color 3000	HP DeskJet 1000Cse	Tally T7070	Tektronix Phaser 300X	Tektronix Phaser 380	Alps MD-2300
Street price	\$500	\$800	\$2,000	\$500	\$900	\$6,000	\$10,000	\$750
Technology	Ink jet	Ink jet	Ink jet	Ink jet	Ink jet	Solid Ink	Solid ink	Micro Dry/ thermal dye
Maximum printable area (inches)	10.5 x 16.3	13.6 x 21.8	13.6 x 21.8	12.6 x 18.5	16.0 x 22.0	11.6 x 17.5	12.7 x 18.0	8.0 x 13.0
Maximum printable area on A-size paper	8.0 x 10.3	8.1 x 10.8	8.1 x 10.8	8.5 x 11.0	8.2 x 10.7	8.0 x 10.6	8.1 x 10.5	8.0 x 10.0
Standard/maximum/tested RAM	64K / 64K / 64K	64K / 64K / 64K	64K / 64K / 64K	512K / 512K / 512K	None	10MB / 22MB / 22MB	16MB / 64MB / 48MB	32K / 32K / 32K
Color resolution with standard RAM (dpi)	720 x 360	1,440 x 720	1,440 x 720	600 x 600	360 x 360	300 x 300	300 x 300	600 x 600
Color resolution with maximum RAM (dpi)	720 x 360	1,440 x 720	1,440 x 720	600 x 600	360 x 360	300 x 300	600 x 300	1,200 x 600
Four-color printing (CMYK)	■	■	■	■	■	■	■	■
Three-color printing (CMY) with overlay	■	■	■	■	■	■	■	■
Fastest/highest-quality color speed (ppm)	2.0 / 0.2*	5.0 / 0.3*	7.0 / 0.2*	3.5 / 0.6	0.8 / 0.3	1.0 / 1.0	3.5 / 1.2	3.0 / 0.1
Engine manufacturer	Canon	Epson	Epson	HP	Canon	Tektronix	Mitsubishi	Alps Electric
Paper Handling and Interfaces								
Number/capacity of paper inputs (sheets)	1 / 100	1 / 100	1 / 100	3 / 160	1 / 200	2 / 200	2 / 250	1 / 20
Heaviest paper stock or proprietary paper	30 lbs.	24 lbs.	24 lbs.	36 lbs.	28 lbs.	120 lbs.	120 lbs.	Proprietary
Serial-/parallel-port interface	■	■	■	■	■	■	□ (\$245) ■	■
Bidirectional/ECP parallel support	■	■	■	■	■	■	■	■
C-size parallel/LocalTalk port	■	□ (\$149)	□ (\$149)	■	■	■	□ (\$245)	■
SCSI port	■	■	■	■	■	■	■	■
Ethernet adapter	■	□ (\$399)	□ (\$399)	■	■	□ (\$595)	□ (\$595)	■
Token-Ring adapter	■	■	■	■	■	□ (\$895)	□ (\$895)	■
Driver for Windows 95/3.1/NT	■	■	■	■	■	■	■	■
Driver for OS/2 / Mac OS	■	■	■	■	■	■	■	■
Features and Consumables								
Technique for graphics enhancement	Error-diffusion dithering	AcuPhoto	AcuPhoto	Layering	Stochastic dithering	Adobe Brilliant Screens	Adobe Brilliant Screens	True continuous tone
Highest PCL supported	None	None	None	None	None	PCL 5	PCL 5	None
Highest PostScript supported	Level 2	Level 2	Level 2	None	Level 2	Level 2	Level 2	Level 3
PostScript emulation vendor	Adobe	Epson	Epson	N/A	Adobe	Adobe	Adobe	Adobe
Host RAM required for GDI printing	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Color management support	Canon Color Gear, ColorSync 2.0	Pantone	Pantone	HP ColorSmart, Pantone	PostScript Color Calibration, Win 95 Color Management	Pantone, PhaserMatch, TekColor	Pantone, PhaserMatch, TekColor	ColorSync 2.0 (Mac), Pantone
Rated life of color ink or ribbon	300 pages	300 pages	2,100 pages	450 pages	200 pages	400 pages	4,200 pages	20 pages
Estimated cost per page with color coverage at 25 percent/75 percent	\$0.75 / \$2.25	\$0.15 / \$0.45	\$0.13 / \$0.41	Info not available	Info not available	\$0.24 / \$0.73	\$0.19 / \$0.50	\$3.00 / \$3.00
Customer Support								
Toll-free technical support	■	■	■	■	■	■	■	■
Technical-support hours (eastern time)	24 hours, 7 days	9:00-9:00 M-F	9:00-9:00 M-F	8:00 A.M.- midnight M-F, noon-7:00 Sat.	10:00-8:00 M-F	9:00-8:00 M-F	9:00-8:00 M-F	9:00-9:00 M-F
Warranty	1 year	2 years	2 years	1 year	1 year	1 year	1 year	1 year
Web address	www.ccsi.canon.com	www.epson.com	www.epson.com	www.hp.com	www.tally.com	www.tek.com/ Color_Printers/	www.tek.com/ Color_Printers/	www.alpsusa.com

* The vendor did not supply a rating for the highest-quality color speed; this figure is based on PC Magazine Labs' test results
N/A—Not applicable: The product does not have this feature.

DeskJet had trouble maintaining detail in darker areas.

On our tests, the DeskJet was generally faster than the other ink jets we saw. Overall, the HP DeskJet 1000Cse is well suited for its target market of business users who produce small runs of specialty color graphics. Users who produce many color-intensive graphics per day should consider the Epson Stylus 3000.—*James Karney*

Hewlett-Packard Co., Santa Clara, CA: 800-752-0900, 415-857-1501; www.hp.com. *Circle 441 on reader service card.*

QMS ColorScript 480

SPECIFICATIONS: 0.25-ppm tabloid-capable thermal dye printer. Resolution: 300 dpi standard, 600 by 300 dpi maximum. Tested configuration: \$12,500 street.

The QMS ColorScript 480 offers a wealth

of high-end features to graphics professionals who need a tabloid-capable continuous-tone color proofer. Both Macintosh and Windows users will find a lot to like in its sharp and brilliant output, and it is reasonably affordable for a large-format thermal dye printer.

The ColorScript 480's most unique and important feature is its support for continuous-tone printing on letter-size,

COVER STORY

Color Graphics Printers

See www.pcmag.com for interactive views

PC MAGAZINE
EDITOR'S CHOICE

PC MAGAZINE
EDITOR'S CHOICE

Eastman Kodak DS 3650 PS	Fargo Pictura 310e	QMS ColorScript 480	Tally SpectraStar 280	Tally SpectraStar DSx	Tektronix Phaser 450	Tektronix Phaser 490X
\$7,500	\$5,000	\$12,500	\$3,290	\$5,990	\$7,500	\$13,800
Thermal dye	Thermal wax/ thermal dye	Thermal dye	Thermal wax	Thermal dye	Thermal dye	Thermal dye
8.5 x 12.0	12.0 x 17.4	12.1 x 17.5	8.1 x 10.8	9.3 x 12.7	9.3 x 12.7	11.9 x 17.2
8.9 x 8.9	8.8 x 11.3	N/A	8.1 x 10.8	8.3 x 10.5	8.3 x 10.5	8.2 x 10.1
32MB/32MB/ 32MB	None	24MB/136MB/ 24MB	10MB/32MB/ 32MB	16MB/96MB/ 96MB	16MB/64MB/ 64MB	32MB/112MB/ 96MB
300 x 300	300 x 300	300 x 300	600 x 300	600 x 600	300 x 300	300 x 300
300 x 300	300 x 300	300 x 600	600 x 300	600 x 600	300 x 300	300 x 300
■	■	■	■	■	■	■
■	■	■	■	■	■	■
0.7/0.7	0.3/0.1	0.3/0.2	2.0/2.0	1.5/0.5	2.0/2.0	2.3/2.3
Kodak	Fargo	Mitsubishi	Sharp	Sharp	Sharp	Mitsubishi
1/100	1/25	1/60	1/50	1/50	1/50	1/60
63 lbs.	Proprietary	Proprietary	60 lbs.	Proprietary	Proprietary	Proprietary
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■
□ (\$995)	■	■	□ (\$795)	□ (\$795)	□ (\$595)	□ (\$595)
■	■	■	■	■	■	■
■	■	■	■	■	■	■
■	■	■	■	■	■	■
True continuous tone	True continuous tone	True continuous tone	True continuous tone	True continuous tone	True continuous tone	True continuous tone
None	None	None	None	None	None	None
Level 2	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2
Adobe	Adobe	Adobe	Pipeline	Pipeline	Adobe	Adobe
N/A	32MB	N/A	N/A	N/A	N/A	N/A
ICC, Pantone, Ultra Color	ColorSync 2.0, FargoColor by Candela	Pantone	Pantone	Colorimetric, Euroscale, Pantone, SWOP	Pantone, PhaserMatch, TekColor	Pantone, PhaserMatch, TekColor
100 pages	100 pages	210 pages	342 pages	100 pages	100 pages	210 pages
\$2.09/\$2.09	\$5.35/\$5.35	\$4.95/\$4.95	\$0.58/\$0.56	\$2.48/\$2.48	\$2.13/\$2.13	\$8.67/\$8.67
■	■	■	■	■	■	■
9:00-8:00 M-F	8:30-6:30 M-F	7:00-6:00 M-F	10:00-8:00 M-F	10:00-8:00 M-F	9:00-8:00 M-F	9:00-8:00 M-F
1 year	1 year	90 days	1 year	1 year	1 year	1 year
www.kodak.com	www.fargo.com	www.qms.com	www.tally.com	www.tally.com	www.tek.com/ Color_Printers/	www.tek.com/ Color_Printers/



The QMS ColorScript 480 is a solid choice for PC and Mac pros.

ColorSync 2.0, SWOP, CIE international color standards for color matching and calibration, and European Color.

The ColorScript consistently delivered excellent graphic images, fully saturated continuous tones, uniform line widths, and a good color range. Color registration was a bit off, however; gaps appeared in test images when either red or blue was matched with black ink. But this was not noticeable in "real-world" output files. Speed was on a par with that of other high-end thermal dye printers, and the ColorScript's performance is fast enough to be unobtrusive.

The QMS ColorScript 480 will appeal equally to Windows and Macintosh users, thanks to its excellent output quality and intelligent design. There's a lot here to show for the price.—Jon Hill

QMS Inc., Mobile, AL; 800-523-2696, 334-633-4300; www.qms.com. Circle 451 on reader service card.

Tally T7070, SpectraStar 280, SpectraStar DSx

TALLY T7070 SPECIFICATIONS: 0.8-ppm oversize tabloid-capable four-color ink jet printer. Resolution: 360 dpi. Tested configuration: \$900 street.

SPECTRASTAR 280 SPECIFICATIONS: 2-ppm letter-capable thermal wax printer. Resolution: 600 by 300 dpi. Tested configuration: \$3,290 street.

SPECTRASTAR DSx SPECIFICATIONS: 1.5-ppm letter-capable thermal dye printer. Resolution: 600 dpi. Tested configuration: \$5,990 street.

The name Mannesmann Tally has long been synonymous with high-volume impact printers for corporate back-office and government use. As the impact printer market has dwindled, the company (now called Tally Printers) is expanding its focus to other business printing mar-

tabloid-size, and wide tabloid-size paper or transparencies. It features an internal 540MB hard disk for downloadable fonts, and comes standard with 24MB of memory and a host of built-in PostScript typefaces. In addition, it boasts a plethora of standard connection interfaces, including bidirectional parallel, serial, AppleTalk, and SCSI ports.

The setup manuals are well thought

out, but the installation procedure itself gave us a bit of trouble. After physically hooking up the ColorScript via its parallel port and then booting Windows 95, the Add New Hardware wizard found and identified the printer but was unable to properly install the driver. We were forced to quit the install and run the Add Printer routine. Extras include support for the Pantone matching system, Apple

NOW YOU CAN

image YOUR
hard drive

IN A **flash!**

INTRODUCING **Drive Image.™** THE FASTEST, EASIEST WAY TO
IMAGE YOUR HARD DRIVE FOR **backups, upgrades AND**
complete system recovery.

Buy Now!
\$15
Cash Back
from PowerQuest

When you need an instant copy of your hard drive, Drive Image is the picture-perfect solution. You can easily create and store a compressed image file of your entire hard drive, or just selected partitions, on a JAZ, Zip, network, or second hard drive. That makes backups a breeze, and even a dreaded hard-drive crash is no problem. To restore your system, simply download your drive's image file from its storage source and you're ready to go. Drive Image also makes upgrading to a larger hard drive a snap. Simply copy everything from your old drive to your new drive. You can even specify the size of the partitions on the new drive during copying so everything fits the first time. And Drive Image is fast. Its patent-pending SmartSector™ technology works up to two to three times faster than straight file-by-file or sector-by-sector methods of copying. That saves you time and a lot of aggravation. For more information about Drive Image, visit our Web site at **www.powerquest.com**. Multiple workstation or site licensing options are also available. Call **1-800-379-2566** for details.

Buy Drive Image and get \$15 back from PowerQuest. Ask your local reseller for details.



Babbage's Etc. • Best Buy • CDW • CompUSA • Computer City • Egghead • Electronics Boutique • Fry's
Future Shop • J&R • Micro Center • Micro Warehouse • PC Connection • Tiger Direct

© 1997 PowerQuest Corporation. All rights reserved. PowerQuest is a registered trademark and Drive Image is a trademark of PowerQuest Corporation. Patents pending.

FROM THE MAKERS OF PARTITIONMAGIC®

CIRCLE 176 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

POWER
PQ
QUEST

COVER STORY
Color Graphics Printers



The Tally T7070 Ink Jet and SpectraStar 280 thermal wax printers were competent. The SpectraStar DSx was disappointing.

kets—chief among them being color printing. These three color offerings target distinct segments of the market, and their features and pricing run the gamut from light-duty office output to

professional-quality thermal dye printing. The T7070 and SpectraStar 280 are competent printers; we were disappointed with the output quality of the SpectraStar DSx.

If you're accustomed to using dot-matrix printers, you'll feel right at home with Tally's T7070 ink jet. Designed for business users who need oversize (up to 16- by 22-inch) color printing, it is the only printer in this roundup that supports automatic sheet feeders. While this versatility will serve its audience handily, the bare-bones user interface and unimpressive software driver could make the T7070 an uncomfortable choice for some audiences.

Setting up and running the unit can be difficult. Adjusting the front-panel menus requires extensive help from the manual,

which is fortunately quite complete. The Windows 95 driver setup is cumbersome, relying on a set of cryptic icons on the LED display and some less-than-intuitive on-screen menus.

During testing, the T7070 produced crisp text and straight, clean lines. Fonts were well formed, and blacks were solid. We noticed slight registration problems (a thin white line between adjoining colors) on some test files, but gradient fills were even and solid, with only slight banding in the paler regions. Although a bit obstinate, the T7070's unique large-format capability and automatic sheet feeding features could make it the darling of some workgroups.

The letter-size SpectraStar 280 is a more traditional business machine: a fast, inexpensive, three-color thermal wax printer for churning out presentations, reports, and transparencies. The unit automatically senses which of three ribbon types is installed (three-color for plain paper, three-color for transparencies, or monochrome), and it can sense which of its multiple ports is receiving input (the

Never miss a beat.

CLICK HERE
to learn how Aquanta™ servers for
Windows NT® offer you maximum availability.

www.aquanta-systems.unisys.com

UNISYS
When information is everything.

© 1997 Unisys Corporation. Aquanta is a trademark of Unisys Corporation. Windows NT is a registered trademark of Microsoft Corporation.



*While supplies last and by returning your registration IBM Business Partner and Solutions for a small planet are trademarks of International Business Machines

the
“Our finance department
deals with all the paperwork.
Unfortunately the finance
department is also me.”
solution

The IBM No More Paperwork Solutions.

Nobody sets up a business because they like doing paperwork. All too often being your own boss means long hours spent shuffling forms instead of chasing dreams.

IBM accounting solutions can automate tasks from accounts receivable and payable to inventory management. The result? A clear picture of your overall cash flow and improved cash management. And they run on the most popular operating systems out there. So you can get down to business, without disrupting business. We can also help

finance your acquisition with flexible and attractive leases.

Buy any IBM accounting solution and get a Dun & Bradstreet “Business Solution in a Box™” (a \$2,500 value, absolutely free).*

Call IBM at 1 888 IBM-2992, ext. 1023, and we’ll send you a free “Guide to Doing Business on the Internet.”

We’ll also put you in touch with an IBM Business Partner™, an independent expert who can provide you with accounting solutions best suited to your business. For more information, visit us at www.businesscenter.ibm.com



Solutions for a small planet™

parallel, serial, or AppleTalk ports, or a \$795 Ethernet port).

Although setup is fairly easy overall, the installation manual only covers Windows 3.x, and in our labs the printer did not trigger the Install New Hardware wizard during installation under Windows 95. Output quality was on a par with other thermal wax printers: There was some banding, noticeable dithering patterns, and a restricted color range. But the SpectraStar 280 was among the fastest dedicated color printers in our roundup. Although there are some glitches, the unit delivers remarkably quick printouts at an acceptable quality for most users. But unless fast transparencies are crucial, business users could do just as well for less money with an ink jet.

The SpectraStar DSx is a letter-size thermal dye printer that originated as an offering from the now-defunct General Parametrics. Targeted at high-end graphics professionals, it is inexpensive for its class and generates correspondingly below-par output. Setup is cumbersome due to a lack of plug-and-play support, and the Help and Read Me files still refer to the SpectraStar DSx as a General Parametrics product. (The user manual dates from 1994.)

During testing, photographic samples were dark and muddy, although the SpectraStar DSx maintained good detail even in shadowed areas. Banding was noticeable on our continuous-tone test. On speed tests, the unit proved to be one of the slowest graphics printers in the roundup. A tough sell overall, the SpectraStar DSx needs an updated design if it is to compete with other thermal dye printers that offer better quality at similar prices.—JH and JK

Tally Printers Inc., Kent, WA; 800-426-4813, 425-251-5524; www.tally.com. Circle 452 on reader service card.

Tektronix Phaser 300X, Phaser 380, Phaser 450, Phaser 480X



PHASER 300X SPECIFICATIONS: 1-ppm tabloid-capable solid ink printer. Resolution: 300 dpi. Tested configuration: \$6,000 street.

PHASER 380 SPECIFICATIONS: 3.5-ppm tabloid-capable solid ink printer. Resolution: 300 dpi standard, 600 by 300 dpi maximum. Tested configuration: \$10,000 street.



Tektronix's solid ink printers, the 300X and 380, offer good alternatives to thermal wax.

PHASER 450 SPECIFICATIONS: 2-ppm letter-capable thermal dye printer. Resolution: 300 dpi. Tested configuration: \$7,500 street.

PHASER 480X SPECIFICATIONS: 2.3-ppm tabloid-capable thermal dye printer. Resolution: 300 dpi. Tested configuration: \$13,800 street.

Tektronix has long been a leader in the high-end color market, with printers that boast top-notch output quality and impressive speed. This year's offerings continue that tradition, with four printers designed primarily for in-house proofing. Three of the printers (the Phaser 300X, Phaser 380, and Phaser 480X) can handle any size paper up to super B-size. For users who want dither-free, thermal dye output but only need to print on smaller paper, the Phaser 450 is a super A-size alternative. Each targets a slightly different need, but all are worthy of your attention.

All four offer LocalTalk, whether as part of the standard bundle or as an option, and all offer optional EtherTalk, NetWare, and TCP/IP support. All also use Adobe PostScript Level 2. Beyond these basics, however, each printer has a distinct personality.

Because of its unique design, the Phaser 300X is a solid ink printer that can print on virtually any stock that will fit through the printer, including sandpaper and paper towels should you have the

need. Setup is easy: Plug in the cables, feed in the wax sticks, and wait for the wax to melt. The printer's LCD readout gives plenty of warning when it's time to add more wax. Note that the Phaser 300X is not meant for transparencies, since each individual wax drop would just turn into a tiny lens on an overhead projector.

During testing, the Phaser 300X's dithering produced a slightly grainy effect, particularly in photos. But for business graphics and other color work, we found that colors were fully saturated, solid areas were fully filled, gradients showed no banding, and thin lines in graphics and text were reasonably crisp and clean. We ran our tests at the highest-quality setting, out of the three built-in speed modes the unit offers. The Phaser 300X's overall performance was in the middle of the range for dedicated color printers.

The key strength of the Phaser 300X is clearly its ability to print on an unusually wide range of paper stocks. But if that's not your main concern, you'll still find this printer to be an appealing option for relatively inexpensive tabloid-size proofs and graphic prints of less than photo quality.

The Phaser 380 is the big brother of the Phaser 350 that we review with the laser printers in this issue. Its super-B size earmarks it for graphics, however, and it does the job with virtually no hassles or glitches. Like the Phaser 300X, the Phaser 380 uses solid ink, but it sprays the ink onto a drum, then rolls the drum against the page. This process limits it to more traditional paper choices, but still lets the unit handle up to 120-pound paper stock.

Setup is easy, just as with the Phaser 300X. Output quality is also much the same as for the Phaser 300X, but with less obvious dithering, so that at arm's length photos approach real "photo quality." Performance was good enough to make the Phaser 380 one of the fastest graphics-oriented printers included in our roundup.

The Phaser 380 won't let you print on quite the same range of stock as the Phaser 300X, and it costs roughly twice as much. But it offers much higher quality output and is fast enough to serve for on-demand printing as well as proofs. In all likelihood,

COVER STORY
Color Graphics Printers



Tektronix's thermal wax printers, the Phaser 450 and Phaser 480X, deliver great-looking output at good speeds.

the more pages you need to print, the more attractive the Phaser 380 will look.

For even more realistic photo output, try one of Tektronix's thermal dye offerings. The Phaser 450 offers some of the best output in its class, and it's among the fastest of such units. The accompanying software

the unit prints photos at true photographic quality, with color, subtle shading, and details in light and dark areas all a match for photographic prints. Graphics are equally impressive, with fully saturated colors and crisp edges. It takes a nitpicker's eye to see a hint of banding on some of the tougher

can also create custom profiles to match the commercial press used for final output. It should be on your short list for letter-size proofs and digital photographic output.

Setup for the Phaser 450 is typical for a thermal dye printer, and reasonably easy: Install the ribbon and paper, plug in the cables, install the software, and print. Output quality is superb;

test gradients. Overall, for fast, super A-size, high-quality thermal dye output, the Phaser 450 is an excellent choice.

If you want 300-dpi thermal dye quality but need to work in tabloid size, Tektronix offers the Phaser 480X. This printer not only matches the Phaser 450 in output quality but surpasses it.

Setup is essentially the same as for the Phaser 450. More important, the output shares all of the high quality of the Phaser 450 but with even less banding. On our tests—even when we printed on B-size paper—the Phaser 480X was mostly in the middle range, though sometimes it was faster than average. It occupied last place when printing our Photoshop image, but the splendid output was worth the wait.

The Tektronix Phaser 480X is one of the very best all-around color printers we saw. If super-B is your size, and thermal dye is your technology, then the Phaser 480X might be your printer.—MDS Tektronix Inc., Wilsonville, OR; 800-835-6100, 503-682-7377; www.tek.com/Color_Printers/. Circle 444 on reader service card. 



Looking for help? Look for this sign.

The solution is here. IBM Business and financing. And there are tens of Partners are independent experts thousands worldwide. To find one who who can help you find the right specializes in your line of business, mix of technology, support, price call 1 888 IBM-2992, ext. 9999.

Breakthrough Size



Breakthrough Price

"We definitely need large screen displays to run our graphics programs. However, there isn't room in our small office for big 21" (various viewables) monitors. When we saw the 19" (18.0" viewable) Optiquest V95, we knew we'd found a winner."

Talk about breakthrough size! Optiquest® took the concept of a large screen 21" (various viewable) monitor, combined it with the small footprint of a 17" (various viewable), and created a brand new display – **the 19" (18.0" viewable) V95 monitor.**

Imagine! A screen large enough to handle graphics, business and Internet applications for PC and Mac® systems, yet small enough to fit into the limited space of a small office. In fact, the 19" (18.0" viewable) Optiquest V95 delivers the best of a traditional 21" (various viewable) screen, but costs approximately 45% less.

This display offers impressive performance with its 1,600 x 1,280 maximum resolution, 95kHz horizontal scan rate, super fine 0.26mm dot pitch for sharp, crisp images and a flat

square screen. And it also includes OnView® controls for simple on-screen adjustments – all at the affordable Optiquest price. Plus it's backed by a limited three-year warranty.

Why settle for less? Get the best of both worlds – large screen performance in a small footprint. **Call 800-843-6784**, ask for agent 6587 to obtain the name of the dealer nearest you.

All business decisions should be this easy!

OPTIQUEST®

A ViewSonic® Company

438 Cheryl Lane, Walnut, CA 91789
(800) 843-6784
Internet: www.optiquest.com

Corporate names and trademarks stated herein are property of their respective companies. Specifications subject to change without notice. Copyright © 1997, ViewSonic Corporation. All rights reserved.



CIRCLE 117 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



IN THIS REVIEW	
Acer America Corp.	189
Advanced Logic Research Inc.	200
AST Computer	205
Compaq Computer	208
Dell Computer Corp.	212
Digital Equipment Corp.	212
Micron Electronics Inc.	217
S.A.G. Electronics Inc.	219
"PC Labs Home-Brewed Special"	220

servers. CHEAP.

Most of these nine servers deliver good performance and management capabilities—and for \$6,500 or less.

By Steve Rigney

In the past, small businesses and workgroups in need of file servers had two choices. They could opt for the big, expensive devices meant for large corporations. Or they could go the more affordable route: a standard desktop PC stuffed with several hard disks, more RAM, and a second network adapter—not exactly a high-tech solution.

Today, you don't have to make that choice. All major vendors now have lines of workgroup servers priced more closely to desktop PCs yet with some of the management features of big-time departmental servers. In this roundup, we test nine machines to find a well-designed workgroup server that best integrates the bells and whistles of a departmental

model but without the \$10,000-plus price tag.

So, what is a well-designed workgroup server? It is

- scalable (it grows as your server needs grow);
- redundant (it offers enough backup capability to protect your data in the event of a failure);
- manageable, most important of all (it offers some monitoring software and can alert you in case of failure).

The trick is to provide scalability, redundancy, and manageability without driving up the price. After all, the target market for these servers is a company of fewer than 50 employees (such as a doctor's office, a law firm, or a branch office) that needs a basic file and print server or application server.



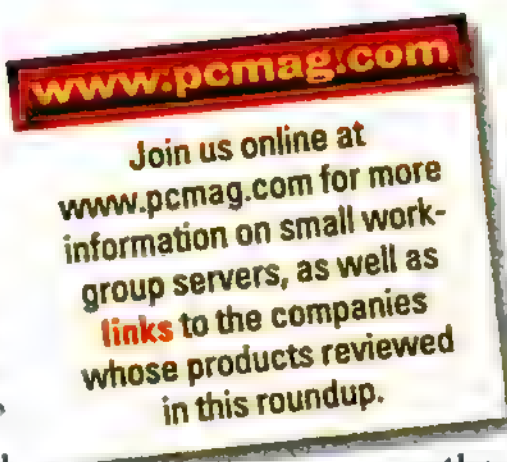
A server also should provide adequate performance, and the server vendor should provide first-class service and support. In this roundup, superior service and support distinguish our Editors' Choice system, the Digital Prioris MX 6200, from an otherwise equally capable offering from ALR.

REVIEW CRITERIA

To be included in this roundup, a server had to come with an x86 CPU (we suggested a Pentium Pro/200); 128MB of system memory, preferably error-correcting-code (ECC) RAM; and two sets of mirrored 4GB SCSI hard disks, one set installed with Novell's IntranetWare and one with Microsoft Windows NT 4.0 Server. We sought the two sets of mirrored drives so we could test each server under the two most popular NOSs on the market. The NOSs were preinstalled by the vendors.

In addition, we asked for two 10/100-Mbps Ethernet adapters, a CD-ROM drive, server management software, and basic 14- or 15-inch color monitors. We also requested (but didn't require) that the units cost about \$6,000 with the monitor.

We received systems from eight of the top server vendors, including Acer America Corp., Advanced Logic Research, AST Computer, Compaq Computer Corp., Dell Computer Corp., Digital Equipment Corp., Micron Electronics, and S.A.G.



Electronics. We also looked at Hewlett-Packard Co.'s NetServer E 45; however, because it was a late preproduction unit we covered it in a sidebar, and it was not eligible for Editors' Choice consideration. IBM was in the midst of developing a new server and could not participate.

To give you some added perspective, we turned an existing PC into a workgroup server by adding more hard disk space and RAM. We examined this roll-your-own PC Labs Home-Brewed Special with the same critical eye as the other products on our Windows NT tests.

EXPANDABILITY AND SCALABILITY

The goal of most small businesses is to grow. Thus you'll want to invest in a workgroup server that can grow with you.

If you are going to use your workgroup server to run client/server applications, you may quickly need a second CPU. Five of the systems in this review accept a second CPU: the ALR Revolution 2X, Dell PowerEdge 2200, Digital Prioris MX 6200, Micron Vetix LXI, and S.A.G. STA Dual Pro.

For file-, print-, and application-server functions, RAM is very important. We believe a workgroup server should handle at least 384MB of ECC memory, preferably in dual in-line memory modules (DIMMs) because they take up less space. The Digital Prioris MX 6200, Micron

Vetix LXI, and the S.A.G. STA Dual Pro can each handle up to 1GB of ECC RAM.

Adapters and expansion slots are the next most important items to consider. Expansion slots take up a lot of valuable real estate on the motherboard, but you never know when you'll need to add a second network adapter, second SCSI controller, or an internal modem.

The trick to saving expansion slots is to embed the most important components on board. Products such as the Digital Prioris MX 6200 include the SCSI, Ethernet, and video adapter cards on board, so all seven slots are free. In comparison, the Acer Altos 900Pro, which also has seven expansion slots, uses two for the Ethernet and SCSI adapters. (Acer does offer on-board SCSI but also includes a second PCI adapter for disk duplexing.)

The number of drive bays in a case is another significant factor. Most of the servers reviewed offer at least four unused bays for adding more storage devices.

REDUNDANCY

A network administrator's biggest fear is that a server will go down and stay down for a long time. The only way to prevent this, besides crossing your fingers, is to have redundant features in your server, the most important of which are fans, power supplies, and hard disks.

Most of the servers reviewed provide redundant fans to make sure that the electronics stay cool. The HP NetServer and Compaq ProSignia 200 even pro-

WORKGROUP SERVERS

How to Read the Suitability to Task Boxes

The **configuration/management** rating represents the quality of each vendor's configuration utilities and the server management solution. Systems rated **excellent** in this category provide utilities for setting up the network operating system and for asset management, network management, and fault tracking; for remote alerts via pager, modem, and SNMP; and for remote reboot and configuration capabilities.

The **performance** rating is a measure of how well the system performed on the three benchmark test suites, ZD ServerBench 4.0, ZD NetBench 5.01, and

AST Manhattan D6200

Configuration/management	Poor
Performance	Excellent
Expandability/scalability	Poor
Service/support	Good

excellent rating means the system garnered high scores on all of these tests.

The **expandability/scalability** rating reflects the server's ability to grow with the needs of the company. Principal considerations include the maximum amount of memory supported, the size of the power supply, the RAID levels supported by the

ZD WebBench 1.1, under two popular network operating systems, Windows NT Server 4.0 and Novell's IntranetWare. An

controller, and the number of important components, such as SCSI controllers, integrated with the motherboard. Servers that we rated **excellent** also offer plenty of free expansion slots and hard disk bays.

The **service/support** rating indicates the vendor's level of commitment to its system. On-site terms and the availability of round-the-clock, toll-free telephone technical support and prefailure warranties are especially important, but the warranty on parts and labor also is considered. A system rated **excellent** in this category delivers a comprehensive package of support offerings.

vide specially designed baffles to direct the air across the motherboard and hard disks. None of the units, however, come with redundant power supplies; for that you'll have to look higher up the server food chain.

One neat trick to increase the performance of your storage system is to use hardware RAID (redundant array of independent disks). RAID is a technique that combines several disks into one volume and allows you to span or stripe data across multiple disks simultaneously, which means that all of the disks are working together to increase access time. There are seven levels of RAID; in each, the data is spanned or striped in a different way.

The systems that supported RAID in this roundup, from Compaq, Digital, and Micron, all support at least Levels 0, 1, and 5. (Only the ProSignia comes standard with the RAID subsystem; the other two vendors offer optional RAID controllers.) We recommend having a minimum of software-based Level 1 (or mirroring) RAID enabled on a workgroup server.

Most hardware-based RAID subsystems allow you to configure a drive as a *hot spare*, an extra drive that will automatically take over if a drive in the RAID array fails. If your workgroup server doesn't offer a RAID controller, you should keep an extra drive available in case of an emergency. Hot-swappable drives are another feature to consider—these are drives you can pull out to replace without shutting down the system. Only the Digital Prioris MX 6200 offers hot-swappable drives.

If you want more protection, a second SCSI controller is useful for *disk duplexing*. Disk duplexing uses two controllers in addition to two hard disks to provide both redundancy and increased performance. In a standard mirrored configuration (two drives with exactly the same data, driven by one controller), if the controller dies, you lose access to your data. However, in a duplexed configuration, a controller or hard disk could crash and the users would never know it. Only AST provided a server with duplexed SCSI controllers.

Our Contributors: STEVE RIGNEY is a contributing editor of *PC Magazine*. MARK STANCZAK is a networking consultant. STEPHEN CHEN is a senior technical specialist at ZD Labs, and MARGARET PIEMONTE is a technical analyst at PC Labs. MARY E. BEHR was the editor in charge of this story, and S. JAE YANG was the project leader.

Editors' Choice

• Digital Prioris MX 6200



Combining excellent management, strong performance and top-notch service and support, Digital Equipment Corp.'s \$6,330 Prioris MX 6200 earns

our Editors' Choice in this roundup of small-workgroup servers.

The Prioris offers hardware RAID, plenty of expansion potential, and ServerWorks management software, which monitors both hardware and NOS traffic. On our tests, the Prioris scored well, thanks to a 10,000-rpm Seagate Cheetah hard disk and a caching RAID controller. And most important, Digital stands out by offering three years of on-site service as well as three years of parts-and-labor coverage and toll-free, round-the-

clock telephone technical support.

The ALR Revolution 2X earns an honorable mention for excelling on our tests, thanks to a Pentium II/266 and a 10,000-rpm Seagate Cheetah hard disk. The system also offers decent server management and expansion capability. However, the warranty package is not as comprehensive as Digital's and that is an important distinction.

Many aspects of the S.A.G. STA Dual Pro were impressive. For \$5,241, the extra-large system offers excellent expansion and test results, but the warranty package is not very competitive.

CONFIGURATION AND MANAGEMENT

Remote management is an essential component of a workgroup server. A good management program will allow you to monitor your server's health from down the hall or from a remote office. Monitoring includes checking the status of the server's hard disks, CPU, and memory.

The AST Manhattan D6200, Dell PowerEdge 2200, Micron Vetix LXI, and S.A.G. STA Dual Pro all bundle Intel's LANdesk Server Manager as their management platform; the others include their own proprietary solutions. Each of the management products works with SNMP traps generated by an agent in the server to send alerts and warnings to a client PC.

LANdesk is a powerful utility that allows you to view information about the most important components of your server, such as the power supplies' output voltages, the temperature inside the chassis, and the status of the cooling fans.

Among the proprietary solutions, we especially liked the AcerAltos 900Pro's

Remote Diagnostics Manager, which uses a modem attached to the server to page you if something goes wrong. The modem then goes into auto-answer mode to wait for you to dial in and perform diagnostics. The HP NetServer E 45 provides similar functionality by including a special version of Symantec's remote control software, pcAnywhere. The Digital ServerWorks Manager package stands out for monitoring how many network packets your adapter is sending and receiving.

PERFORMANCE

We ran benchmark tests that look at a product's performance as a file and print server and as an application server running IntranetWare and Windows NT. The combination of ZD's NetBench, WebBench, and ServerBench test suites simulates the worst traffic a workgroup server is likely to experience in a file and print, Internet/intranet, or client/server environment.

To no one's surprise, the speed of the CPU and the speed of the hard disk were important performance factors. The ALR Revolution 2X was one the most impressive performers, thanks to a powerful duo of a Pentium II/266 processor and 10,000-rpm Seagate Cheetah hard disks.

SERVICE AND SUPPORT

Parts-and-labor warranties are included with every machine reviewed (except the PC Labs Home-Brewed Special); most offer a three-year term. All the vendors also offer at least one year of on-site service and toll-free technical phone support, but the terms and condition vary.

Compaq also includes a "prefailure

warranty" for its memory and hard disks via a monitoring utility in Compaq's Insight Manager 2.0. Other vendors offer smart hard disks, which can sense imminent failure on their own.

ONE LAST BIT OF ADVICE

Picking the perfect workgroup server also depends on the number of users and the

types of applications they are going to run. If a file and print server is all you need, a strong management and a fast disk subsystem are your main concerns. If you're setting up an intranet or application server, look at the units that can handle a second CPU and 1GB of RAM. Read the following reviews to help you make the best choice for your business.

Sensible Storage Management

If money were no object, every network administrator would purchase a 4-mm or 8-mm DAT or a DLT SCSI backup device and expensive software to go with it. A 4-mm DAT device can handle between 2GB and 12GB of data; an 8-mm device can handle up to 12GB. However, each of these solutions costs \$600 to \$1,000, plus an additional \$200 for a SCSI adapter. The DLT device offers the best performance, but external devices run from \$4,000 to \$6,000; tapes handle up to 70GB and cost \$50 each.

Because cost is an important consideration for small businesses, a DAT or DLT device may not be an option. Other solutions are available, however. Among the least expensive choices are cartridge devices such as the Iomega Jaz drive. They cost about \$200 to \$500 and allow you to back up about 1GB of data. Unfortunately, 1GB is not much for even a small network, the devices don't attach directly to your Windows NT or NetWare server for centralized backup and restore, and the cartridges cost between \$100 and \$130.

The most popular inexpensive device for network backup is called a Travan; products such as the Iomega Ditto and the Hewlett Packard SureStore T4i use it. Travan is the latest version of the QIC (quarter-inch cartridge) tape backup technology. Various levels of Travan devices have different capabilities. Products in the Ditto line (\$150 to \$200 street) use Travan 3 drives, which rely on a floppy-disk controller interface, are relatively slow, and only store 1.6GB, 3.2GB with compression. Travan 4 drives, such as the ones found in the SureStore T4i package (\$450 street), use an IDE or SCSI interface so they are much faster, offering backup speeds of up to 35MB per minute. These drives can also hold 4GB of data, 8GB with software compression.

The internal Ditto also includes software to back up a local PC and a server across the network. However, you cannot directly install the standard Ditto on your Windows NT or NetWare server. The HP T4i includes software for local backup, and it comes with drivers that allow you to use the

backup utility in Windows NT, SCO Unix, and NetWare with the drive.

A Travan 4 cartridge sells for \$35, while a standard DDS2 DAT costs from \$4 to \$16. If you use a lot of tapes, you may find that a DAT is a less expensive solution in the long run.

The backup software included with Windows NT and NetWare is very basic and doesn't offer features such as flexible scheduling, tape rotation, disaster recovery, and reporting. If you want these, you will need a storage management application. Two of the best storage management packages are Seagate BackupExec and Computer Associates Cheyenne ARCserve. Each costs about \$700 for a single server, but they both work with Travan and the more expensive tape drive solutions.

Knowing how much capacity you need, how many tapes you will use, and the features you require from your backup software will help determine which of these storage solutions is best for you. Remember: Your data is only as good as your last backup.—Steve Rigney

Backup Pros and Cons			
	Description	Estimated cost	
CARTRIDGE	Lowest-capacity device available, the Iomega Jaz or SyQuest SyJet.	Hardware, \$200-\$500; media, \$100-\$130.	PROS Cartridges are easy to use and store up to 1GB of data. CONS A slow technology; the cartridges are expensive and can store only about 1GB-1.5GB.
TRAVAN	Popular backup technology used in the Iomega Ditto and Hewlett-Packard SureStore T4i.	Hardware, \$150-\$450; media, \$35-\$100.	PROS Travan 4 drives are fast and can store up to 8GB of data with compression. CONS Travan 3 drives are slow and can store only up to 3.2GB of data with compression.
DAT	A high-capacity digital tape available in 4-mm and 8-mm configurations. This drive most popular for servers and suitable for multiple backups.	Hardware, \$600-\$1,000; media, \$4-\$16.	PROS DAT works with every major OS and all backup utilities. The tapes are inexpensive, and the 8-mm format holds 10GB-12GB. CONS The drives are fairly expensive, and it requires a SCSI connection.
DLT	High-capacity digital tape available in 4-mm and 8-mm configurations. This drive most popular for servers and suitable for multiple backups.	Hardware, \$4,000-\$6,000; media, \$50-\$100.	PROS DLT drives are fast and can store up to 70GB of data with compression. CONS They are the most expensive.

**Now, tapping into the
technological resources
of one of the world's
largest computer
companies is as easy as
picking up the phone.**



An entirely new approach to buying computers.

You'll be amazed at the depth of resources you have at your disposal simply by calling our toll-free number. For starters, you'll be talking to one of our knowledgeable System Consultants. More than just operators, they'll not only answer your call, they'll work closely with you to develop unique solutions to your



Introducing NEC NOW.SM

unique needs. NEC NOW also gives you the choice of working with a highly qualified NEC reseller partner. Either way, you'll be backed by a powerful, worldwide brand with a

history of technological innovations. Like the first color laptop, one of the first portables with MMX™ technology, and NEC's most recent breakthrough: an entirely new way of using your telephone.

Why NEC NOW?

- The security of partnering with a company known for its technological innovations.
- The flexibility of ordering direct or through a reseller.
- The expertise of System Consultants.
- The immediate availability of competitively priced products.
- The resources of one of the world's largest computer companies.



**BUILT
TO
ORDER**



©1997 NEC Computer Systems Division, Packard Bell NEC, Inc. NEC, Versa, and MultiSync are registered trademarks; VersaBay, A700, C700, C500, ESM, PortBar, MiniDock and Express5800 are trademarks, and UltraCare is a service mark of NEC Corporation, all used under license by Packard Bell NEC, Inc. Direction, VersaNote, VersaExec, and MagicEye are trademarks and NEC NOW is a service mark of Packard Bell NEC, Inc. Leasing based on typical 36-month lease with purchase option. Other lease options may be available, leasing arranged by third party leasing company to qualified customers. Prices do not include shipping or applicable sales tax, are valid in the US only and are subject to change without notice. Products and specifications are subject to change without notice. *Product is 56Kbps capable. However, due to FCC rules which restrict power output of the service providers' modems, current download speeds are limited to approximately 53Kbps. Actual speed may vary depending on line conditions. MS, IntelliMouse, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. NetWare and Novell are registered trademarks of Novell, Inc. The Intel Inside logo, LANdesk and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other trademarks and registered trademarks are property of their respective owners.



NEC Versa 6200 Series T133 640x480 13.3" TFT Color Display

Common Features: 64-bit CPU and 32-bit PCI Bus Architecture • 32-bit CardBus Support • 2MB VRAM • 256KB L2 Pipeline Burst Cache • 16-bit Stereo Sound with 3D Spatializer Technology • DMI 2.0 Compliant • Intel® LANDesk® Client Manager 3.0 • VersaBay™ II Option Slot Accepts CD-ROM, Floppy Drive (both included), Optional 2nd Hard Drive and 2nd Battery • Lithium Ion Battery • MS® Windows® 95 • Upgradeable 3-Year Limited Warranty

Versa 6200MX

- 13.3" XGA Active Matrix TFT Color Display
- 166MHz Pentium® processor with MMX technology
- 64MB EDO DRAM (128MB max)
- 3GB Hard Drive/10X avg CD-ROM
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional NEC Docking Station 6000 Plus, add \$899
- * Optional VersaExec™ Leather Carrying Case, add \$199
- * Upgrade to Microsoft® Windows NT® 4.0 with Free Telephone Support, add \$99

\$4399

Business Lease: \$154/mo

Versa 6200MX

- 13.3" XGA Active Matrix TFT Color Display
- 166MHz Pentium processor with MMX technology
- 32MB EDO DRAM (128MB max)
- 2.1GB Hard Drive/10X avg CD-ROM
- * Upgrade to 3GB Hard Drive, add \$299
- * Optional 2nd Lithium Ion Battery, add \$199
- * NEC Xircom I0Base-T Network Card, add \$139
- * Optional Versa MiniDock™ 6000, add \$499

\$3799

Business Lease: \$133/mo.

NEC Versa 6060 Series T133 640x480 13.3" TFT Color Display

Common Features: PCI Bus with 128-bit Graphics Accelerator • 32-bit CardBus Support • 2MB VRAM • Integrated 16-bit Stereo Sound • USB Port • VersaBay II Option Slot Accepts CD-ROM, Floppy Drive (both included), Optional 2nd Hard Drive and 2nd Battery • Lithium Ion Battery • DMI 2.0 Compliant • Intel LANDesk Client Manager 3.0 • Upgradeable 3-Year Limited Warranty

Versa 6060

- 166MHz Pentium processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 48MB EDO DRAM (80MB max)
- 2.1GB Hard Drive/20X max CD-ROM
- U.S. Robotics® x2™ XJACK® 56Kbps* Fax Modem
- MS Windows NT 4.0 with Free Telephone Support
- * Optional Versa Docking Station 6000 Plus, add \$899
- * Upgrade to a 3.2GB Hard Drive, add \$299

\$4099

Business Lease: \$143/mo.

Versa 6060

- 166MHz Pentium processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 32MB EDO DRAM (80MB max)
- 2.1GB Hard Drive/20X max CD-ROM
- MS Windows 95
- U.S. Robotics x2 XJACK 56Kbps* Fax Modem
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional Versa MiniDock 6000, add \$499
- * Optional VersaPro™ Ballistic Nylon Carrying Case, add \$99

\$3849

Business Lease: \$135/mo.

NEC Direction™ PC1 15" 1024x768 15" TFT Color Display

Common Features: Mini-Tower or Desktop Tool-Less Chassis • 24X max CD-ROM • 3.5" Floppy Drive • MS Windows® 95 • MS Office 97 SBE • 2 USB Ports • Microphone • Palmrest Keyboard and MS IntelliMouse® • 3-Year Limited Warranty with 1-Year On-Site Service • DirecPC Satellite Dishes are Now Available as Upgrades

Direction SPT233

- 233MHz Pentium processor with MMX technology/ 512KB L2 Pipeline Burst Cache
- 6.4GB Ultra DMA Hard Drive, 9.5ms
- 64MB SDRAM
- Number Nine PCI Revolution 3D, 8MB WRAM
- Altec® ACS-45 Speakers/AWE32 Wavetable Audio
- Iomega® Zip Drive
- U.S. Robotics 56Kbps* Data/Fax/Voice Modem
- NEC C700™ 17" Monitor (16" viewable/v.i.s.)
- * Upgrade to 128MB SDRAM, add \$379
- * Upgrade to Altec ACS-410 Speakers with ACS-251 Subwoofer, add \$69

\$2889

Business Lease: \$104/mo.

Direction SPT233

- 233MHz Pentium processor with MMX technology/ 512KB L2 Pipeline Burst Cache
- 7.0GB Ultra DMA Hard Drive
- 32MB SDRAM
- Number Nine Imagine 3, 4MB WRAM
- Altec ACS-45 Speakers/AWE32 Wavetable Audio
- Iomega Zip Drive
- U.S. Robotics 56Kbps* Data/Fax/Voice Modem
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to NEC MultiSync® A700™ 17" Monitor (15.6" v.i.s.), add \$229
- * Upgrade to 64MB SDRAM, add \$199

\$2649

Business Lease: \$95/mo.

Direction SPT233

- 233MHz Pentium processor with MMX technology/ 512KB L2 Pipeline Burst Cache
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-45 Speakers/AWE32 Wavetable Audio
- NEC C700 17" Monitor (16" v.i.s.)
- * Upgrade to Altec ACS-410 Speakers with ACS-251 Subwoofer, add \$69
- * Optional U.S. Robotics 56Kbps* Data/Fax/Voice Modem, add \$119

\$2379

Business Lease: \$86/mo.

Direction SPT233

- 233MHz Pentium processor with MMX technology/ 512KB L2 Pipeline Burst Cache
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-45 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- * Upgrade to NEC C700 17" Monitor (16" v.i.s.), add \$199
- * Upgrade to AWE32 Wavetable Audio, add \$49

\$1949

Business Lease: \$70/mo.

Call now for immediate delivery from our factory or for a free catalog.

Model 6200MX \$117 (MSRP \$1,195.00)

1-888-8-NEC-NOW

www.necnow.com (1-888-863-2669)

NEC

NEC Versa 2700 Series

Common Features: PCI Bus with 128-bit Graphics Accelerator • 256KB L2 Pipeline Burst Cache • 32-bit CardBus Support • 2MB VRAM • USB Port • 56Kbps* Integrated Modem • Stereo Speakers and Subwoofer with 3D Stereo Sound • DMI 2.0 Compliant • Intel LANdesk Client Manager 3.0 • MS Windows 95 • Bundled MS Software Including MS Word 97 • Upgradeable 1-Year Limited Warranty

Versa 2760MT

- 166MHz Pentium® processor with MMX™ technology
- 12.1" SVGA Active Matrix TFT Color Display
- 16MB EDO DRAM (96MB max)
- Built-in 1.44GB Hard Drive, 16X max CD-ROM, 1.44MB Floppy Drive, and Lithium Ion Battery
- * Upgrade to 48MB RAM, add \$299
- * Optional 2nd Lithium Ion Battery, add \$199
- * Optional Versa PortBar™ 2700 Port Replicator, add \$159
- * Optional NEC Xircom 10Base-T Network Card, add \$199

\$2999

Business Lease: \$108/mo.

Versa 2730MT

- 133MHz Pentium processor with MMX technology
- 12.1" SVGA Active Matrix TFT Color Display
- 16MB EDO DRAM (96MB max)
- Built-in 1.44GB Hard Drive, 16X max CD-ROM, 1.44MB Floppy Drive, and NiMH Battery
- * Upgrade to 32MB RAM, add \$159
- * Optional VersaNote™ Ballistic Nylon Carrying Case, add \$69
- * Optional Lithium Ion Battery, add \$199
- * Upgrade to 2.1GB Hard Drive, add \$149

\$2699

Business Lease: \$97/mo.

NEC Direction PC

Common Features: Mini-Tower or Desktop Tool-Less Chassis • 24X max CD-ROM • 3.5" Floppy Drive • MS® Office 97 SBE • 2 USB Ports • Microphone • Palmrest Keyboard and MS IntelliMouse • 3-Year Limited Warranty with 1-Year On-Site Service • *DirectPC Satellite Dishes are Now Available as Upgrades*

Direction SPL300

- 300MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX PCIset
- 9.0GB SCSI Hard Drive
- 64MB SDRAM
- Adaptec 2940UW SCSI Controller
- Number Nine Imagine 3, 4MB WRAM
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- Jomega Zip Drive
- NEC C700 17" Monitor (16" viewable/v.i.s.)
- MS Windows NT 4.0
- * Upgrade to 128MB SDRAM, add \$379
- * Upgrade Video Memory to 8MB WRAM, add \$119

\$4229

Business Lease: \$147/mo.

Direction SPL233

- 233MHz Pentium II processor/512KB Integrated L2 Cache
- ATX Motherboard with 440LX PCIset
- 4.3GB Ultra DMA Hard Drive
- 32MB SDRAM
- 4MB SGRAM AGP Graphics Card
- Altec ACS-90 Speakers/Integrated Yamaha Sound
- NEC C550 15" Monitor (14" v.i.s.)
- MS Windows 95
- * Upgrade to 7.0GB Hard Drive, add \$109
- * Upgrade to Number Nine AGP Revolution 3D, 4MB WRAM, add \$219

\$2199

Business Lease: \$79/mo.

NEC Express5800™ Series Servers

Common Features: Integrated PCI Wide Ultra SCSI Disk Controller • Integrated PCI SCSI Controller for Media Bays • Integrated SVGA Controller • 1MB VRAM (upgradeable to 2MB) • 12X CD-ROM • 3.5" Floppy Drive • Mouse and Keyboard • NEC ESM™ Pro Server Management Software • MS Windows NT Server 4.0 and NetWare® 4.11 Certified • 3-Year On-site Service Warranty

Express5800 LE2200

- Dual Capable Pentium II System w/one 266MHz Pentium II processor/512KB Integrated L2 Cache
- 64MB ECC DIMM Memory (512MB Maximum)
- One 4.3GB Ultra Wide SCSI Disk
- 8 Expansion Slots, 4 PCI, 3 ISA, 1 Shared
- 7 Drive Bays, 3 External 5.25", 4 Internal 3.5"
- * Optional Second 266MHz/512KB Pentium II processor, add \$1099
- * Additional 64MB of ECC Memory, add \$449
- * Optional PCI Ultra Wide SCSI RAID Controller, add \$1349
- * 2/4/9GB Ultra Wide SCSI Disk Drives for up to 36GB of Storage Space, add \$529/\$849/\$1299
- * Optional MS Windows NT Server 4.0, add \$799

\$3959

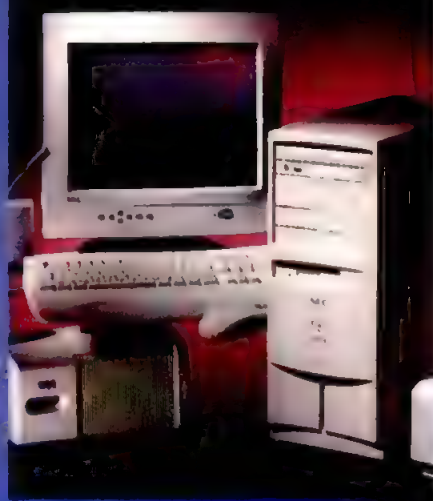
Business Lease: \$139/mo.

Express5800 LE2000

- Dual Capable Pentium Pro System w/one 200MHz Pentium Pro processor/256KB Integrated L2 Cache
- 32MB ECC DIMM Memory (1GB Maximum)
- One 2.1GB Ultra Wide SCSI Disk
- 8 Expansion Slots, 4 PCI, 3 ISA, 1 Shared
- 7 Drive Bays, 3 External 5.25", 4 Internal 3.5"
- * Optional Second 200MHz/256KB Pentium Pro processor, add \$799
- * Additional 32MB of ECC Memory, add \$189
- * Optional PCI Ultra Wide SCSI RAID Controller, add \$1349
- * 2/4/9GB Ultra Wide SCSI Disk Drives for up to 36GB of Storage Space, add \$529/\$849/\$1299
- * Optional MS Windows NT Server 4.0, add \$799

\$2699

Business Lease: \$97/mo.



Call now for immediate delivery from our factory or for a free catalog.

Circle 154 Reader Service Card

1-888-8-NEC-NOW

WWW.NECNOW.COM (1-888-863-2669)

NEC

CIRCLE 154 ON READER SERVICE CARD

AcerAltos 900Pro

SPECIFICATIONS: *Pentium Pro/200, IBM DCAS-34330 5,400-rpm hard disk, Advanced Server Manager Pro. Tested configuration: \$5,120 street.* The AcerAltos 900Pro covers all the bases: The system offers superb local- and remote-management software and hardware as well as a lot of room for additional adapters and hard disks. Additionally, the AcerAltos proved to be a decent Intranet server and application server for a small workgroup in the Windows NT environment, based on our benchmark tests.

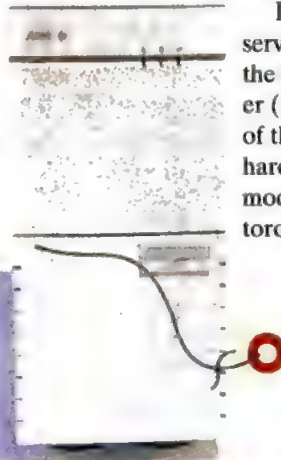
The Acer StartUp Kit Version 3.0 makes the server extremely easy to set up and configure. The StartUp software allows you to configure all of your adapters and other hardware components and to automatically install several OSs, including Novell's IntranetWare, SCO Open-

Server, and Netscape FastTrack Server. All you need to provide is a certification key for the software package you choose to install. The CD also includes online documentation and technical-support phone numbers.

After you have the server up and running, you can use the Advanced Server Manager (ASM) Pro to monitor and manage the system. ASM is a Microsoft Windows-based utility that allows you to monitor any AcerAltos running Windows NT, NetWare, or SCO Unix. The software communicates with an SNMP agent on the server to provide information on components including the internal cooling fans and conditions such as CPU temperature and

line voltage. You can use ASM to manage multiple servers from a remote location or connect the management PC directly to a server.

If you want to monitor the server 24 hours a day, you'll like the Remote Diagnostic Manager (RDM). The RDM consists of the manager software and a hardware module. The RDM module has an on-board Motorola CPU and firmware that



AcerAltos 900Pro	
Configuration/management	Excellent
Performance	Good
Expandability/scalability	Good
Service/support	Fair

If you need an affordable workgroup server, you should seriously consider the AcerAltos 900Pro.

Price/Performance Index: Small Workgroup Servers

Amid some tough competition, several machines stand out on our price/performance chart. The \$5,241 S.A.G. STA Dual Pro earned some of the best scores in this roundup, especially at higher client loads. The unit also offers impressive expandability and good network management. However, S.A.G.'s parts and labor warranty is only two years long—a year shorter than the majority of others in the roundup—and the vendor charges for on-site service.

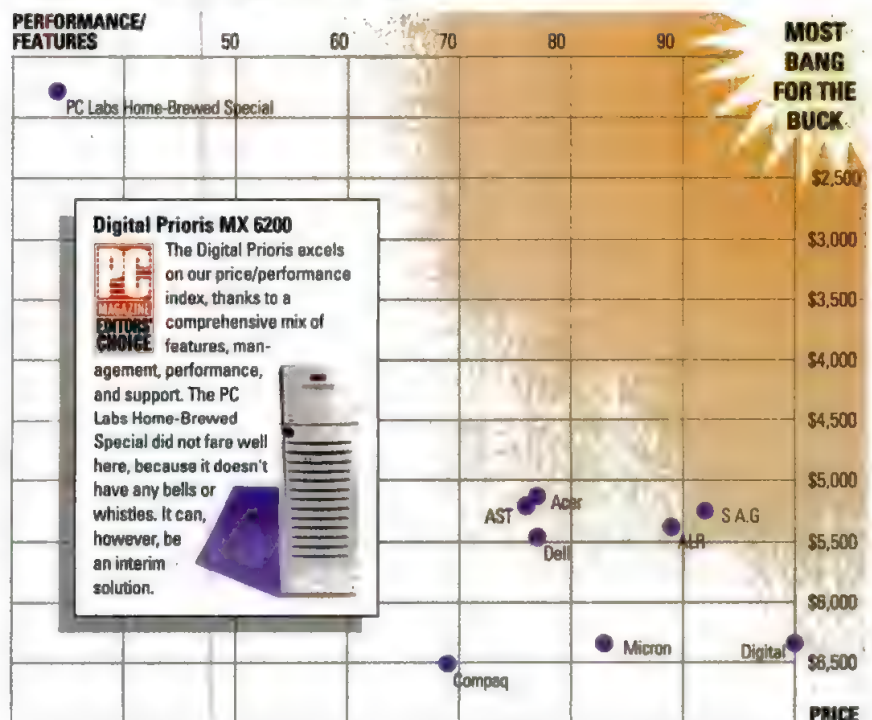
The \$5,370 ALR Revolution 2X was also an outstanding performer, garnering top scores across our tests. Advanced Logic Research offers a three-year warranty on peripherals and labor and a five-year warranty on the main system; on-site service is \$10 per year.

The \$6,330 Digital Prioris MX 6200, our Editors' Choice recipient, offers a complete package. It's loaded with fast hardware and Digital's excellent management software, Server-Works. Digital tops this off with competitive performance across our tests as well as a comprehensive support policy, which includes three years of on-site service.

THE DATA POINTS

Performance on our three benchmark test suites accounts for 30 percent of the price/performance total. Service and support offerings, including length of on-site service and availability of telephone technical support, make up

another 15 percent. Management functions such as pager alerts account for another 9 percent. The remaining score is based on such features as the total number of drive bays, maximum installable RAM, and maximum number of processors supported.





Correct us if we're wrong,
information in



Presenting workgroup servers

from Compaq. Put simply, the goal is to minimize cost and risk for your business. To that end, we're offering a full line of workgroup servers to meet a range of functionality

and budget needs. The ProSignia 200 is an entry-level server at the price of a desktop. The ProLiant 800 provides excellent price:performance and expandable features. The ProLiant 850R is a new one we're excited about. It's the industry's first rack-ready, high-density workgroup server that won't cause hemorrhaging in the accounting department. And

but we presume all of the your company is critical.

the scalable, high-performance ProLiant 2500 is quite possibly the most flexible server you can buy. No one in your company need compute like a second-class citizen again.

No matter which of our servers you choose, you'll receive a full suite of management software from Compaq like SmartStart and Insight Manager to easily deploy and manage your server.

Optimizing your workgroup's overall performance is also done simply with Compaq's range of memory and hardware options like manageable UPS products, a full range of tape backup and proven RAID technology that integrates seamlessly into existing networks.

Workgroup servers and options from Compaq. One place where trickle-down economics actually works. For more information, visit us at www.compaq.com/products/servers.

COMPAQ

BENCHMARK TESTS

Workgroup Servers



Using all the server benchmark tests in our arsenal, we sized up eight workgroup servers from the top vendors and one unit put together by PC Labs. When the data points were plotted, a few servers showed intermittent brilliance, but the ALR Revolution 2X performed consistently near the top on all the tests under both Microsoft Windows NT and IntranetWare. The PC Labs Home-Brewed Special couldn't keep up with more than a few clients loaded.

What the Numbers Mean

NetBench is the most relevant test program for this type of server, and we found that there isn't a lot of performance variance at a load of up to eight clients. Beyond that, there is a big difference in how the various servers perform. Thus, any server reviewed here will suffice for a very small workgroup, but if you expect your business to grow, look carefully at the data beyond eight clients.

The Digital Prioris MX 6200 and the S.A.G. STA Dual Pro, both equipped with 10,000-rpm Seagate Cheetah Ultra SCSI drives, performed well on our NetBench tests, but their Pentium Pro/200 CPUs were no match for the Dell PowerEdge 2200's Pentium II/266 CPU on our WebBench tests. The ALR Revolution 2X, with a Pentium II/266 CPU and a Cheetah drive, showed no weakness on any of the three benchmark test suites.

The three benchmark test suites we used, ZD NetBench 5.01, ZD WebBench 1.1, and ZD ServerBench 4.0, all employ stress tests. They pound away at the servers with a workload simulating a worst-case scenario. This method yields highly repeatable data indicative of the server's upper limit in a short amount of time with a fairly small client load. Since we used test suites that load the servers with 1 to 60 clients, the performance can be plotted in scalability curves with respect to the number of active clients. Using these curves, we can focus on a server's ability to serve a small workgroup, and we can project the potential for growth into a departmental server or even a Web server. In this roundup, we emphasize the results with small numbers of clients. Because our tests represent extreme situations, the NetBench throughput score with only four clients may be enough to characterize a server's performance in a real-world 15-node network where all the clients would not be likely to access the server simultaneously.

To put the servers in better perspective, we also found a Pentium/133 system and built our own Windows NT server by packing the machine with a couple of 5,400-rpm Ultra SCSI hard disks (IBM DCAS-34330s) and two Intel Pro 10/100 network interface

cards. We put this unit, which we dubbed the PC Labs Home-Brewed Special, through the same tests as the other servers under Windows NT.

ZD NetBench 5.01 Because we consider the servers in this roundup to be primarily workgroup file servers, we consider the NetBench test results to be the most significant. NetBench measures a server's ability to handle file I/O requests. The test suite is highly network-bound and exercises the hard disks heavily; it produces a performance curve that scales up to 60 clients. Each data point on the curve represents the server's total throughput, measured in kilobytes per second (KBps), with a specific number of clients. Initially, the throughput increases with the number of clients until the server's limited I/O bandwidth is completely inundated. Beyond this, transacting with more clients only adds to the system overhead, and the total throughput begins to decline.

Under Windows NT, the NetBench data showed a strong correlation with hard disk speed. The Digital Prioris MX 6200, S.A.G. STA Dual Pro, and ALR Revolution 2X, all with 10,000-rpm Seagate Cheetah disks, placed at the top of the group throughout the scalability curve. (The Digital and S.A.G. machines maxed out at 20 clients, and the ALR unit at 16.) The Dell PowerEdge 2200 and the Compaq ProSignia 200, using 7,200-rpm Barracuda disks, were in the middle of the pack, while the AST Manhattan D6200 and the AcerAltos 900Pro, with 5,400-rpm IBM disks, landed at the bottom. The underequipped PC Labs Home-Brewed Special with the same IBM disks was severely outclassed by all the servers in this roundup, but it almost kept pace with the pack with up to 4 clients, which may correspond to 15 to 20 in real-world terms. The results under IntranetWare were a bit more erratic but followed a pattern similar to those under Windows NT—ALR and Dell at the top, and Micron, Acer, and AST near the bottom. (The PC Labs Home-Brewed Special was not tested under IntranetWare.)

ZD WebBench 1.1 The test suite ZD WebBench 1.1 simulates both static and dynamic Web transactions. The static test suite simply involves HyperText Transfer Protocol (HTTP) requests for "frozen" HTML files, while the dynamic suite involves more complex execution of CGI scripts (under IntranetWare) or ISAPI commands (under Windows NT). The Web is effectively a client/server network with varying levels of complexity over TCP/IP. Therefore, WebBench taxes the processor more heavily than NetBench does. A typical scalability curve in WebBench rises with the number of clients, then flattens out when the WebBench workload saturates the server's capacity to handle HTTP requests. Measurements are taken in two ways—throughput (in KBps) and total requests per second. Because the two types of measurements yield almost identical scalability curves, we plot the results only in requests per second.

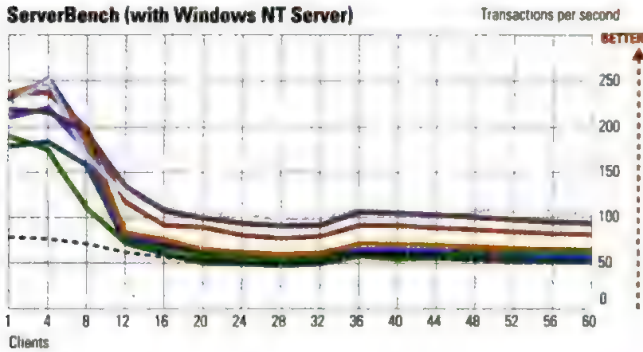
As expected, here the processor was the clear differentiating factor. The Dell and ALR systems, which use the Pentium II/266, were at the top on both dynamic and static tests under both NOSs. The AST and Micron machines, using Pentium Pro/200 CPUs with 256K of L2 cache, were consistently at the bottom. Again, the Pentium/133-based PC Labs Home-Brewed Special almost kept up until it took on more than four clients on the static WebBench tests, but it did not even come close to the others with any number of clients on the dynamic tests.

The variance in results was more pronounced under IntranetWare, with the Compaq machine joining the AST and Micron systems at the bottom, far below the servers from Dell and ALR.

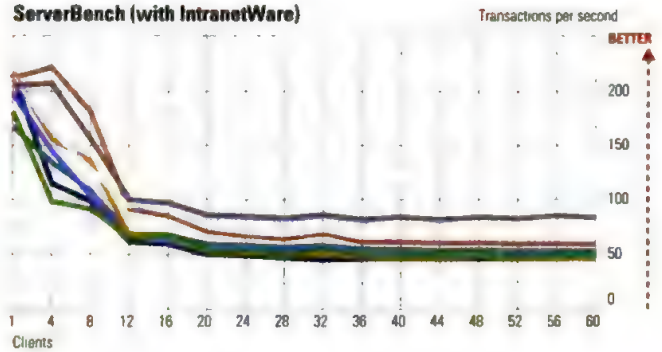
PCs
Workgroup Servers

AcerAltos 900Pro AST Manhattan D6200 Dell PowerEdge 2200 Micron Vetix LXI PC Labs Home-Brewed Special
 ALR Revolution 2X Compaq ProSignia 200 Digital Prioris MX 6200 S.A.G. STA Dual Pro

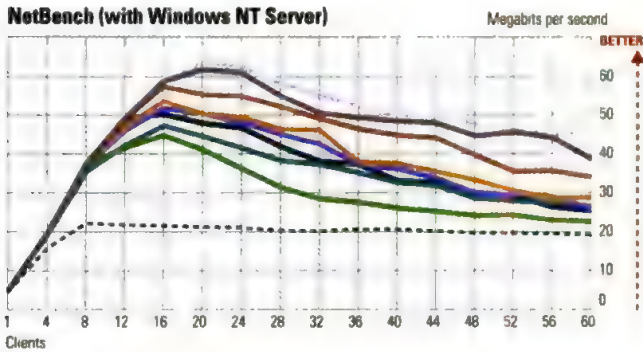
ServerBench (with Windows NT Server)



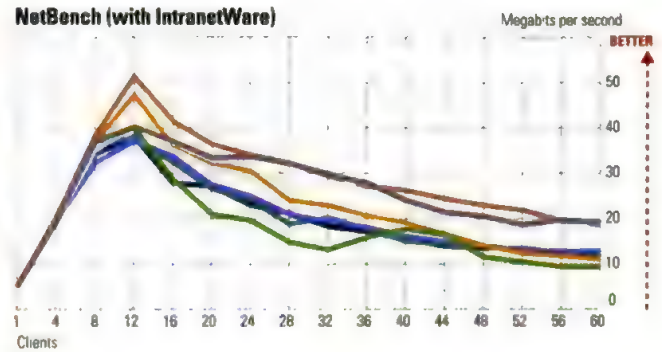
ServerBench (with IntranetWare)



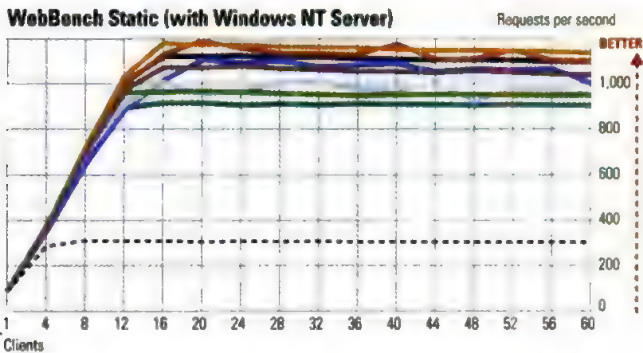
NetBench (with Windows NT Server)



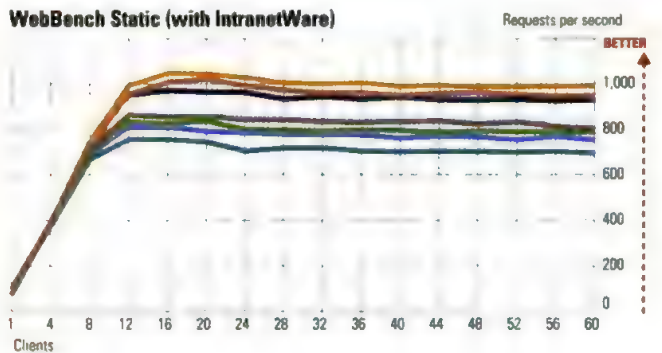
NetBench (with IntranetWare)



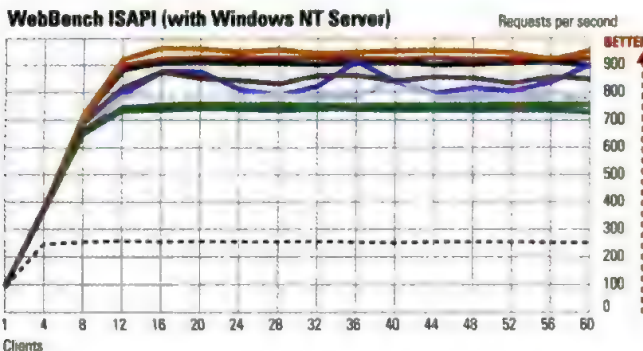
WebBench Static (with Windows NT Server)



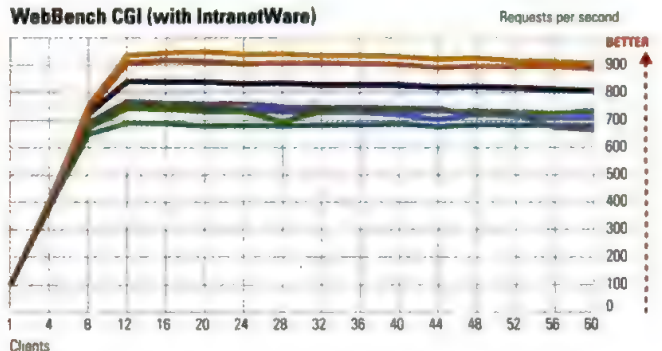
WebBench Static (with IntranetWare)



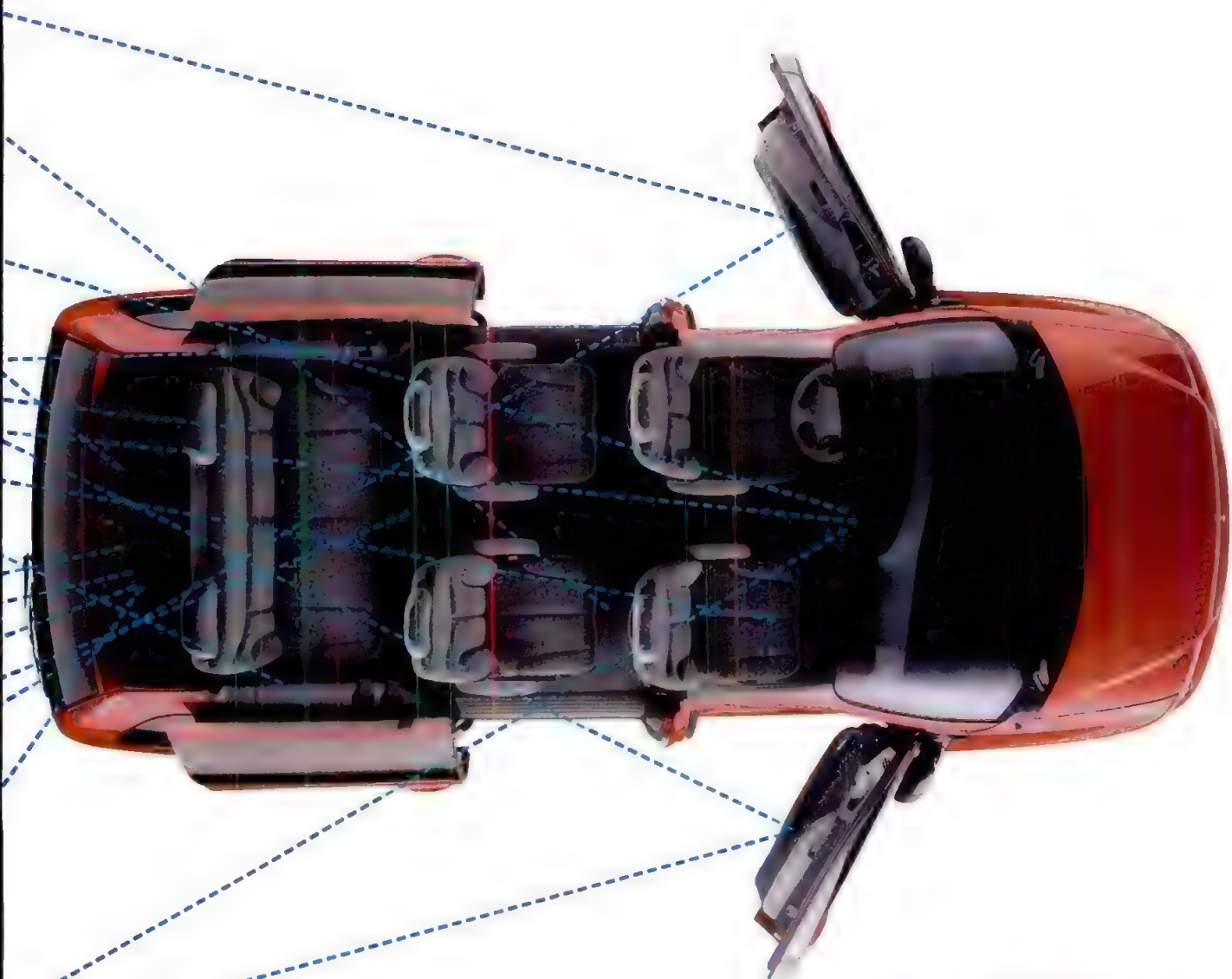
WebBench ISAPI (with Windows NT Server)



WebBench CGI (with IntranetWare)



You've got to hand it to our engineers in the compartment department.



Caravan  The New Dodge

Always use seat belts. Remember a backseat is the safest place for children. Properly secure all cargo.

For info, call 1-800-4-A-DODGE or visit our Web site at www.4adodge.com

BENCHMARK TESTS

As was the case with NetBench, there was little performance variation with up to eight clients. Therefore, if you are looking for an intranet or Internet server designed for a small number of Web surfers at a time (less than 25), then any one of the servers reviewed here will satisfy your needs. But if you anticipate any growth in demand for your Web contents, look to the right side of the scalability curve and pick out the servers near the top.

ZD ServerBench 4.0 Although we do not expect these servers to function in client/server settings, we subjected them to considerable stress with ZD ServerBench 4.0, which is processor-intensive and challenges a server's hard disk subsystems. The test results are reported in transactions per second at each client load level, from 1 to 60 clients.

As expected, the scalability curves peaked earlier than on our NetBench tests, at around four clients, and declined rapidly as more clients were loaded under both NOSs. With less than eight clients (that is, when the network I/O is not yet saturated), the servers with faster CPUs (the Dell and ALR systems) seemed to have the advantage. But with more than eight clients, even the Pentium II/266 machines reached their processing limits, and the servers with faster hard disks (those by Digital, S.A.G., and ALR) began to dominate. The PC Labs Home-Brewed Special, with only a Pentium/133, was nowhere near the group at less than eight clients, but when the CPU was no longer the deciding factor, it kept pace with the bottom tier, the AST and Micron units. The results show that the Acer, Compaq, Dell, and Digital servers are slightly more adept in serving databases under Windows NT than under IntranetWare.

While running ServerBench under IntranetWare, we learned that one needs to be wary of the SCSI driver installed. The servers from AST, ALR, and Dell posted much lower ServerBench scores when tested with the Adaptec AIC 7870 SCSI driver (dated September 1996) found on the IntranetWare 4.11 CD-ROM, which the vendors recommended that we use. The results we printed in this roundup were obtained after we updated the driver to the January 1997 version. The scores with the updated driver are significantly higher, especially at low client loads.

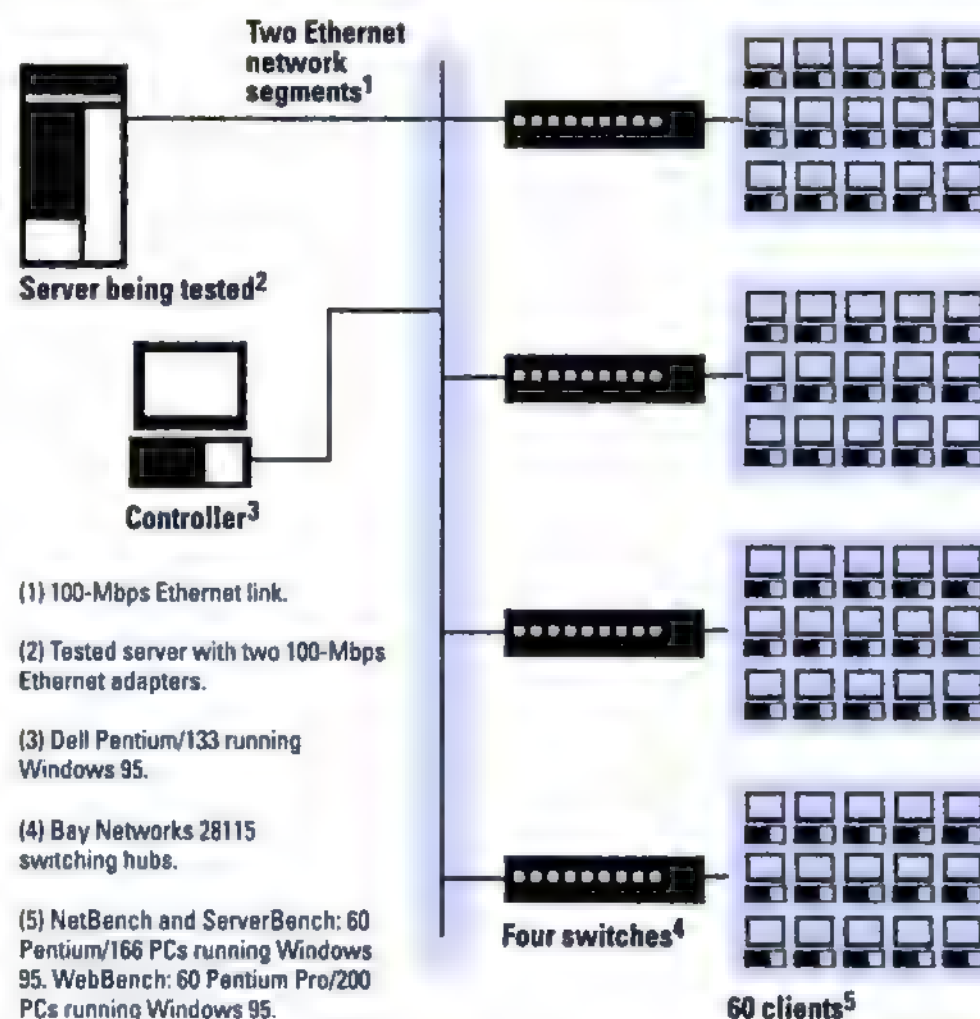
—Analysis written by S. Jae Yang and Stephen Chen

How We Tested

On each server, we ran a comprehensive set of benchmark test suites—ZD NetBench 5.01, ZD WebBench 1.1, and ZD ServerBench 4.0—under two popular network operating systems, Microsoft Windows NT Server 4.0 and Novell's IntranetWare. We tested each of the servers with 128MB of RAM and two 4GB hard disks in a RAID Level 1 mirrored configuration. The total network load for each benchmark test run was 60 clients, beginning with 1 client, then 4, and increasing in increments of 4. We asked each vendor to provide two Fast Ethernet 100Base-T network interface cards so that we could divide the 60-node network into two identical 30-client segments. (We used Fast Ethernet and this segmentation to ensure that our tests were not wirebound, or limited by the network infrastructure outside the server.) We ran the NetBench and ServerBench tests in ZD Labs' LAN lab on one isolated 60-node network of Pentium/166 Windows 95 clients. We ran the WebBench suite in ZD Labs' Internet lab on one isolated 60-node network of Pentium Pro/200 Windows 95 clients. For benchmark test runs with IntranetWare we installed Novell's Client32 in each client, and for tests under Windows NT Server 4.0 we configured each as a Microsoft Network client.

ZD NetBench 5.01 evaluates a server's ability to handle file I/O requests from clients. Although NetBench is a synthetic test program, it profiles the workload on the server caused by actual applications running on the clients. The active clients engage the server with requests for network file operations. During the tests, each client records the amount of data exchanged with the server and the elapsed time. With these pieces of data, the client calculates the throughput for each test session. At the end, the NetBench program sums all the throughput scores reported by the active clients and produces a throughput score for each level of client load.

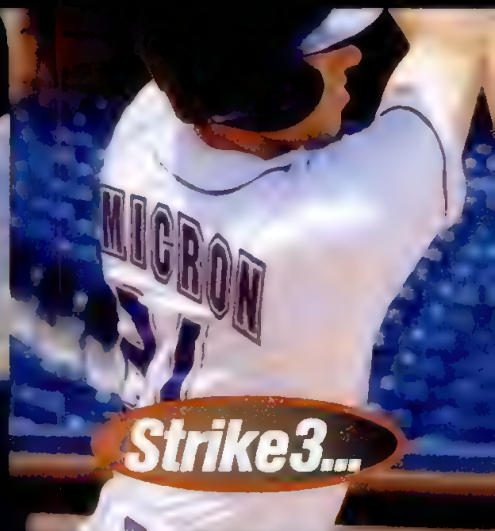
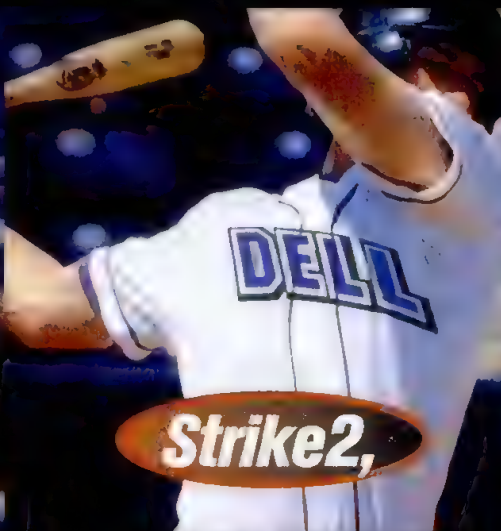
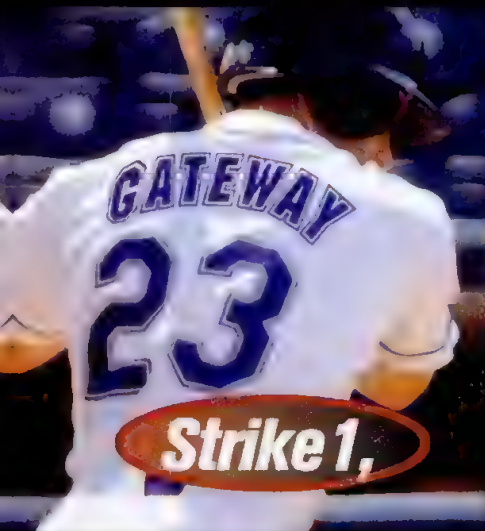
We used **ZD WebBench 1.1** to gauge the servers' skill in serving HTML pages in a small intranet environment. Under Windows



NT Server 4.0, we installed Microsoft's Internet Information System 3 on the servers, and for testing with IntranetWare, we used Novell's own Web server. In WebBench, each client is set up to issue requests in HyperText Transfer Protocol (HTTP) to the server being tested. To mirror real-world scenarios, we tested with static and dynamic requests. The static WebBench tests exercise a server's ability to disburse HTML files, and the dynamic tests involve processing of CGI scripts or ISAPI commands on the server side to produce HTML pages to order. We ran the static suite under both NOSs, but we ran the ISAPI suite only under Windows NT and the CGI suite only under IntranetWare. During the test runs, the clients counted the number of requests that succeeded and failed, as well as the throughput.

ZD ServerBench 4.0 measures the performance of servers in a client/server environment. In ServerBench, the clients send transaction requests to the server. These requests require the server to perform various actions and then send back the resulting data. Each client keeps track of how many requests the server completes and the elapsed time in order to calculate the number of transactions per second. We used the standard ServerBench suite, which combines processor, disk, and network I/O tests to simulate the workload of a database transaction processing system. Like NetBench and WebBench, the tests produce a scalability curve for each server.

HEY, GATEWAY, DELL & MICRON...



...THERE'S A NEW TEAM IN TOWN

HERE COMES THE PITCH...

It's a whole new ball game in personal computers today, as Unicent Technologies steps up to the plate with a dazzling new line of computers, boasting power technology and user-friendliness.

Backed by seven years of making and servicing computers for homes, schools and businesses, Unicent's new line-up is loaded - Pentium II technology, leading-edge peripherals, sophisticated support and competitive prices. And if all that sounds as impressive as the other guys, you've got the right idea!

Plus, we bring a special way of doing business to every product we sell to make your relationship with your Unicent computer the most satisfying it can be - right out of the box.



- It is easy to set up, easy to understand, easy to use.
- It brings you the latest technology and league-leading components for its class.
- It is designed to protect your investment by allowing you to easily change and upgrade your computer as you grow with it.
- It gives you one of the best guarantees available.

You will find your Unicent computer so well-crafted that you should never need service. But if you do, you can count on us 24 hours a day, every day of the year, to be there with the technical support you need.

We pledge this to you, not only because we believe that trust and partnership are simply good business, but also because it's the way we ourselves would like to be treated. On the next three pages, you'll see how we've loaded the bases. Now, it's your turn at the plate.



LEAGUE-LEADING SYSTEMS



UNICENT AVANTA

\$2899

*Business Lease
As Low as \$101/mo

- Intel® 266MHz Pentium® II Processor with 128KB Cache
- 64MB SDRAM [up to 384MB On-Board]
- Tool-Free Tower or Desktop Case
- Ultra DMA/33 IDE controller
- 6.5GB Ultra ATA IDE Hard Drive <10ms
- 17" Flat Screen Monitor
- Matrox Millennium II 8MB VRAM Video
- 24x Toshiba EIDE CDR-ROM
- 3.5" Floppy Drive
- Ensoniq™ PCI Wavetable Sound Card
- 2 USB Ports, Amplified Speakers
- 56K X2™ Technology or K56flex™ Voice/Fax Modem, Speaker Phone
- Microsoft® IntelliMouse™
- 104-key Win'95 Enhanced Keyboard
- MS Windows '95 CD
- MS Office '97 CD, Internet start-up kit
- 5-Year Warranty and 1-Year On-Site Service

AVANTA 233XLP\$2779



266XLP

• **Designed with Intel's 440LX Chipset** - Creating the ultimate performance for the latest power hungry applications. This new chipset provides support for ECC RAM, AGP [accelerated graphics port], OnNow, SDRAM, and Ultra DMA/33 Hard Drive protocol, giving users the latest technology available.



• **Featuring Matrox Millennium II** - The next revolution in graphics technology is here today. Matrox has once again redefined graphics technology with the Millennium II's new MGA-2164W processor. This sixth generation of the MGA chip is a completely new design of the industry standard 64-bit graphics processor and is complemented by a fast 250MHz RAM DAC and powerful dual-ported VRAM memory. The new Matrox Millennium II offers superior graphics performance for the professional user, delivering optimum acceleration in ultra high resolutions such as 1920 x 1200.

**SEARCHING FOR A
GRAND SLAM SYSTEM?
INTRODUCING: THE
TOP OF OUR LINEUP.**



Toshiba DVD-ROM - The next multimedia revolution is at Unicent with the Toshiba DVD-ROM and MPEG-2 hardware compression board for **\$399** [installed]



US Robotics Bigpicture™ Video Kit - A high quality color camera with built-in microphone for true videophone capability. Video Capture card pulls images from home movies or VCR.

Full-Featured 33.6Kbps voice/video faxmodem upgradable to X2™ technology. Features an extensive selection of videophone, VideoFun and online communications software**\$369** [installed]

Unicent Technologies would like to offer sincere gratitude to the players and staff of the Akron Aeros baseball organization.

The Intel Inside Logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation.

UNICENT AVANTA

The Quickest, Most Advanced Operation Available.



AVANTA 266XLS

\$3599

**Business Lease
As Low as \$124/mo.*

- Intel® Pentium II 266MHz processor
- 64MB SDRAM, Intel® 440LX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Adaptec Ultra Wide SCSI controller
- 4.3GB Ultra Wide SCSI Hard Drive 7200RPM
- 15x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Millennium II 8MB VRAM Video
- Ensoniq™ PCI Wavetable Sound Card
- 56K X2™ Technology or K56Flex-Voice/Fax Modem, Speaker Phone
- 2 USB, Amplified Speakers
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows NT 4.0 Workstation
- MS Office '97 CD, Internet start-up kit
- 5-Year Warranty & 1-Year On-Site Service
- 17" Flat Screen, 28 NI Monitor

AVANTA 233XLS

\$3479

AVANTA 266XLA

\$2349

**Business Lease
As Low as \$82/mo.*

- Intel® Pentium II 266MHz processor
- 32MB SDRAM, Intel® 440LX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Enhanced IDE controller
- 4.3GB Ultra ATA IDE Hard Drive • 10ms
- 15x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Mystique 220 4MB SGRAM Video
- Ensoniq™ PCI Wavetable Sound Card
- 56K X2™ Technology or K56Flex-Voice/Fax Modem, Speaker Phone
- 2 USB, Amplified Speakers
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows '95 CD
- MS Office '97 CD, Internet start-up kit
- 5-Year Warranty & 1-Year On-Site Service
- 15" Flat Screen, 28 NI Monitor

AVANTA 233XLA

\$2229

UNICENT TITANA

Optimum Power, Speed and Superb Manipulation



TITANA G-233XS

\$2499

**Business Lease
As Low as \$87/mo.*

- Intel® Pentium 233MHz processor w/MMX™
- 64MB SDRAM, Intel® 430TX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Ultra DMA/33 IDE controller
- 6.5GB Ultra ATA IDE Hard Drive-10ms
- 24x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Millennium II 8MB VRAM Video
- Ensoniq™ PCI Wavetable Sound Card
- 56K X2™ Technology or K56Flex-Voice/Fax Modem, Speaker Phone
- 2 USB, Amplified Speakers
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows '95 CD
- MS Office '97 CD, Internet start-up kit
- 5-Year Warranty & 1-Year On-Site Service
- 17" Flat Screen, 28 NI Monitor

TITANA G-200XS

\$2389

TITANA G-166XS

\$2299

TITANA G-166XL

\$1649

**Business Lease
As Low as \$57/mo.*

- Intel® Pentium 166MHz processor w/MMX™
- 32MB SDRAM, Intel® 430TX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Ultra DMA/33 IDE controller
- 3.2GB Ultra ATA IDE Hard Drive-10ms
- 24x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Mystique 220 4MB SGRAM Video
- Ensoniq™ PCI Wavetable Sound Card
- 56K X2™ Technology or K56Flex-Voice/Fax Modem, Speaker Phone
- 2 USB, Amplified Speakers
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows '95 CD
- MS Office '97 CD, Internet start-up kit
- 5-Year Warranty & 1-Year On-Site Service
- 15" Flat Screen, 28 NI Monitor

TITANA G-233XL

\$1849

TITANA G-200XL

\$1749

UNICENT TITANA

Exceptional Value for Small Offices and Homes



TITANA 200VL

\$1549

**Business Lease
As Low as \$54/mo.*

- Intel® Pentium 200MHz processor
- 32MB SDRAM, Intel® 430TX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Ultra DMA/33 IDE controller
- 2.1GB EIDE IDE Hard Drive
- 24x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Mystique 220 4MB SGRAM Video
- Ensoniq™ PCI Wavetable Sound Card
- 56K X2™ Technology or K56Flex-Voice/Fax Modem, Speaker Phone
- 2 USB, Amplified Speakers
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows '95 CD
- Internet start-up kit
- 5-Year Warranty & 1-Year On-Site Service
- 15" Flat Screen, 28 NI Monitor

TITANA 166VL

\$1489

TITANA 166VA

\$1299

**Business Lease
As Low as \$50/mo.*

- Intel® Pentium 166MHz processor
- 16MB EDO RAM, Intel® 430TX Chipset
- 512KB Pipelined Burst Cache, Flash BIOS
- Tool-Free Tower or Desktop Case
- Ultra DMA/33 IDE controller
- 1.2GB EIDE IDE Hard Drive
- 24x Toshiba EIDE CD-ROM • 3.5" FDD
- Matrox Mystique 220 2MB SGRAM Video
- 3COM 10/100bps
- 2 Universal Serial Bus
- Microsoft® IntelliMouse®
- 104-key Win95 Enhanced Keyboard
- MS Windows '95 CD
- 5-Year Warranty & 1-Year On-Site Service
- 15" Flat Screen, 28 NI Monitor

TITANA 200VA

\$1349

TITANA 133VA

\$1279

Our Convenient Business Hours are: Dawn-Midnight Monday thru Friday
9am-7pm Saturdays and Sunday (Eastern Standard Time).

1-800-731-6526

Unicent Technologies is proud to feature quality components by these manufacturers:

ENSONIQ

matrox

Quantum
CAPACITY FOR THE EXTRAORDINARY™

U-Robotics
The Intelligent Choice in Information Access

TOSHIBA



CIRCLE 055 ON READER SERVICE CARD

**MOST SYSTEMS
WILL BE
SHIPPED IN
48HRS**

CONFIGURE YOUR UNIQUE
SYSTEM ANY WAY YOU WANT
WITH ANY OF THESE GREAT
OPTIONS:

- Iomega Zip Drive IDE int.
w/ 100MB Cartridge.....**\$99**
- Iomega Jaz Drive SCSI int.
w/ 1GB Cartridge.....**\$299**
- 3.2GB Travan Tape Backup
w/ Tape.....**\$189**
- APC Back-UPS PRO 280.....**\$149**
- APC Back-UPS PRO 650.....**\$299**
- For Microsoft® Natural Keyboard
add.....**\$49**
- For Sound System w/ Subwoofer
add.....**\$99**
- For Windows NT 4.0 Workstation
add.....**\$99**
- 3COM Fast Ethernet 10/100
Ethernet Card.....**\$89**

UNI WARRANTY

- 30-Day Unconditional 100%
Money-Back
- Five-Year Parts and Three-Year
Labor Warranty.
- First Year of On-Site Service
Included.
(Three-Year contract add \$99)
- 24-Hour, 7 days a week Toll-free
technical support

unicent
technologies

We put the personal back into personal computers.

280 LENA DRIVE, AURORA, OHIO 44202

1 800 731 6526 • TOLL FREE

216-344-2649 • International Sales

800-731-6159 • Executive De Ventas Bilingue

800-731-6182 • Technical Support

216.344.2647 • FAX

<http://www.unicent.com>



ALL Prices and Specifications Subject to Change Without Notice

Unicent Technologies cannot be responsible for any omissions, errors in typographical or photographic. All Returned Items Must Have RMA #, and Must Be in Original Packaging. Shipping Charges Opened Software and Custom Configured Systems are non-refundable. Absolutely no refunds for merchandise returned after 30 days. Government, School, and Corporate Purchase Orders are always welcome. For More Information On Warranty & Policy Please Call. On-Site Service is a non-refundable option. All logos and brand names are trademarks of their respective companies. *Business Lease payments are based on 36 month fair market value lease and do not include shipping/handling or applicable taxes. Lease rates are subject to change without notice or obligation.

Hewlett-Packard's Promising New NetServer E 45

Sometimes *PC Magazine* roundups catch vendors between production cycles. Such is the case this time with Hewlett-Packard Co. (800-752-0900, www.hp.com). The company's new NetServer E 45, a Pentium II follow-on to the E 40, wasn't shipping in time for our tests. But because of HP's importance in the workgroup server arena, we acquired and tested a near-final system. This new iteration from HP brings mostly average test scores and average scalability to a small workgroup looking to spend under \$5,000. The extensive installation and management software included only sweetens the deal.

The E 45, due to ship in September, is available with either a Pentium II 233- or 266-MHz CPU. The tested E 45 is \$4,990 (street); it had a Pentium II/266 CPU,



128MB of RAM, and two 4GB SCSI hard disks. In informal testing, the system was a mostly average performer, but with its powerful CPU, it fared well on our WebBench tests and on our ServerBench tests with a low client load. (Informal test results are not included in our printed test results.)

Every NetServer comes with the HP NetServer Navigator software. The Navigator has everything you need to install the hardware, software, and management utilities, as well as a foldout "road map" to help you set up the server. There is no detailed information on interrupts, I/O addresses, or other settings, but a software-based help desk called The Information Assistant is included.

The unit also comes with HP Support Anywhere

management software, which has three components: auto-alert, Web interface, and remote console. The auto-alert utility combines an SNMP agent running under Windows NT or NetWare on the server and a Windows-based client interface to monitor for any SNMP alerts or traps. The Web interface lets you view a log of alerts and monitor basic information such as hard disk status using any Web browser. The remote console utility is a special version of Symantec's remote-control software *pcAnywhere* that allows you to dial in to fix problems, run diagnostics, and reboot the PC. Under NetWare, you can also use the built-in Rconsole for remote management.

The E 45 offers six drive bays and six expansion slots. The two PCI slots are used by the HP 10/100 network adapter and the Adaptec AHA2910 Ultra Narrow SCSI controller, however.

HP's E 45 is a very attractive choice for small workgroups.—*Steve Rigney*

constantly monitors server status. If the module encounters a problem such as a failed fan or dead CPU, it will automatically send an alphanumeric page to a preset list of up to three telephone numbers. The RDM then configures the modem connected to your server to answer incoming calls. Once connected and logged in by password, an administrator can run diagnostics, reload software, and even transfer files from a remote location. Every AcerAltos includes a 50MB hidden DOS partition on the hard disk to store diagnostic and other software for the RDM module to use in the event of a server crash.

The AcerAltos comes in a mini-tower chassis with a lot of room for expansion, including seven drive bays, four PCI slots, and three ISA slots. There are also three cooling fans, including one on the CPU. The server comes with a three-year on-site warranty and a one-year warranty for peripherals. Free technical support is available 24 hours, 7 days.

If you need an affordable workgroup server with excellent management and disaster-recovery software, you should se-

riously consider the AcerAltos 900Pro.—*Steve Rigney*

AcerAltos 900Pro. Acer America Corp., San Jose, CA; 800-558-2237; fax, 408-922-2946; www.acer.com/aac. *Circle 461 on reader service card.*

ALR Revolution 2X

SPECIFICATIONS: Pentium II/266, Seagate Cheetah 10,000-rpm hard disk, Infor-Manager server management software. \$5,370 street.

The ALR Revolution 2X was an all-around champion on our benchmark tests. The Revolution's scalability results indicate the server's strong potential to fulfill the needs of a growing workgroup, which means the system's direct price of \$5,370 is quite a value.

Now owned by Gateway 2000, ALR's workgroup server competes favorably against workgroup server offerings from the likes of Dell and Com-

paq. The most notable feature of the ALR Revolution 2X is its ability to be upgraded from a single Pentium Pro/200 up to dual Pentium II/300 CPUs without requiring a motherboard swap (of course you still cannot have a combination of processors). ALR accomplished this engineering feat by designing Pentium Pro daughter cards with Pentium II pin configurations and supplying the appropriate support-bracket hardware for CPU swaps.

The Revolution shares this level of expandability with the Digital Prioris MX 6200.

External access to the Revolution's three hard disk bays, floppy disk drive, 16X CD-



ALR Revolution 2X

Configuration/management	Excellent
Performance	Excellent
Expandability/scalability	Excellent
Service/support	Fair

The ALR Revolution 2X offers a hard-to-beat combination of great features and competitive warranty at a decent price.

GROWTH HAPPENS. MANAGE IT.



DELL® POWEREDGE® 2200 SERVER

233MHz PENTIUM® II PROCESSOR
(Dual Processor Capable, RAID Capable)

- 64MB ECC EDO Memory (512MB Max)
- 512KB Integrated L2 ECC Cache
- Integrated PCI Ultra-Wide SCSI-3 Controller
- 4GB Ultra-Wide SCSI-3 Hard Drive (27GB Max)
- 8X SCSI CD-ROM Drive
- Intel® Pro/100B PCI Ethernet Adapter
- ★ **MS® Windows NT® Server 4.0**
(10 Client Access Licenses)
- ★ **3Com OfficeConnect Hub**
8-port/TPC
- Intel® LANDesk® Server Manager v2.5x
- 6 Expansion Slots: 3 PCI, 3 EISA
- 6 Drive Bays: 3 Hard Drive, 3 Removable Media
- ★ **3 Years Next Business Day**
On-site® Service
- 7x24 Dedicated Server Hardware
Technical Telephone Support
- ★ **APC Smart-UPS 700w Power**
Supply, add \$399.

\$4499

Business Lease : \$156/Mo.
Order Code #250087

THE DELL POWEREDGE 2200 SERVER. EXPANDABILITY FOR YOUR GROWING BUSINESS.

Just because growth is unpredictable doesn't mean it has to be unmanageable. Especially since the Dell PowerEdge 2200, the feature-optimized server with the perfect mix of performance and expandability, can be yours for one of the best prices in the industry.



Advanced technology like Pentium® II processors, dual processing capability, and an optional RAID feature deliver outstanding performance. Call Dell today and we'll start building a PowerEdge server for your growing business immediately. Since it's never too early to get a jump on the competition.

DELL®

TO ORDER TOLL-FREE

800-626-4806

TO ORDER ONLINE

www.dell.com/buydell

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT
Sun 12pm-5pm CT • In Canada: ca-1-800-233-0702
GSA Contract #GS-35F-4076D

Keycode #04552

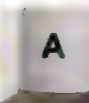
For a complete copy of the Dell Computer Corporation's "Warranty" please write Dell Computer Corporation, 11000 Rockledge Drive, Box 12, Round Rock, TX 78682. *Leasing arranged by third party leasing company with qualified companies. **Standard warranty provided by an independent third party, Dell and its subsidiaries are not responsible for it. ***Intel and Pentium are registered trademarks of Intel Corporation. Dell is a registered trademark of Dell Computer Corporation. Windows and Windows NT are registered trademarks of Microsoft Corporation. 3Com is a registered trademark of 3Com Corporation. Pentium is a service mark of Intel Corporation. Dell Computer Corporation. All rights reserved.

Christian Murphy was non-verbal. He lived with a wall between himself and the world.

1

THIS IS CHRISTIAN.
He can see, hear, feel, touch,
but he cannot speak. He was born
with autistic tendencies that cut
him off from the world around him.





2

A TEACHER DISCOVERED that Christian would respond to images from his life. She put visual cues to the story of his new puppy on a special keyboard.

3

THE MONITOR BECAME HIS

VOICE. With it he makes class reports and conversation. With it, Christian, 11, has been in the regular Osterville, MA public school since first grade



Until he found this window.



4

WITH THE PICTURES, HE MADE SENTENCES.

With the sentences, he made friends. Christian's monitor is the window between his non-verbal world and the speaking world of his friends. Through it, he teaches them many things



NEC MultiSync Monitor E and A Series

THE MONITORS THAT ARE BEST FOR CHRISTIAN'S NEEDS can also speak to yours. Introducing the NEC MultiSync® Enterprise and Advanced Series, the monitors for people looking for superior, lifelike images. And the monitors for people who want the kind of flexibility that super high resolutions and refresh rates ensure.

OSM™ (On-Screen Manager) controls make image adjustments easy. Plus, select Enterprise monitors feature CROMACLEAR™ CRT, for unparalleled focus, contrast and intense color saturation. And, of course, the industry-leading NEC warranty includes 3 years parts, labor and CRT.

For more information on the new performance-driven MultiSync Enterprise and value-oriented Advanced Series call 1-800-NEC-INFO or visit www.nec.com.

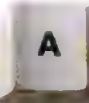


MULTISYNC® MONITORS

	Max Res	Bandwidth	CRT Type	Pitch
A500	1280 x 1024 @ 60Hz	112MHz	Dot Trio	0.28mm dot
A700	1280 x 1024 @ 65Hz	119MHz	Dot Trio	0.28mm dot
E500	1280 x 1024 @ 65Hz	119MHz	CROMACLEAR	0.25mm mask
E700	1600 x 1200 @ 65Hz	177MHz	CROMACLEAR	0.25mm mask
E1100	1600 x 1200 @ 65Hz	177MHz	Dot Trio	0.28mm dot

Expect more. Experience more.

NEC



SUMMARY OF FEATURES

Workgroup Servers

Price of tested configuration This includes the monitor.

Maximum number of processors supported

The ability to have two processors is important if you want to set up an intranet or application server.

Processor location Although most processors are located on the motherboard, some systems offer the CPUs on a riser (or daughter) card to facilitate future upgrades.

Memory type and maximum installable RAM

These indicate the type of memory the vendor sent with the system and the maximum amount the system can accommodate. For an intranet or application server, look at the units that can accommodate up to 1GB of RAM. All of the systems we tested have memory slots on the motherboard, with the exception of the Micron Vetix LXI, which offers slots on a riser card.

Hard disk A fast hard disk subsystem is a key concern for a file and print server.

RAID levels supported by disk controller The system of RAID (Redundant Array of Independent Disks) goes from Level 0 to Level 7, in varying degrees of redundancy. RAID allows you to write data over more than one disk, so that if one disk fails, your data is still secure on another.

RAID controller channels The Micron Vetix offers two RAID channels, making it possible to use two chains of RAID systems.

Temperature sensor location Monitoring the temperature of the server is one of the most important functions of any management package. Various systems place their sensors in different places, such as on the motherboard, on the CPU, and in the power supply.

Asset management/network management

Asset management provides an inventory of hardware. *Network management* consists of monitoring functions including temperature and traffic as well as the status of the server's hardware.

Fault tracking A system with this feature notifies you of any hardware failure and keeps a record.

Components covered under prefailure warranty

Compaq offers a utility that monitors the memory and hard disks and sets off an alarm if it sees certain conditions so that the component can be replaced before it fails. Other vendors offer Smart Drives, which can perform this monitoring on their own. This line indicates which hardware is covered by a prefailure warranty policy.

■ YES ■ NO

Products listed in alphabetical order

	AcerAltos 900Pro	ALR Revolution 2X	AST Manhattan D6200	Compaq ProSignia 200
Price of tested configuration	\$5,120 (street)	\$5,370 (street)	\$5,200 (street)	\$6,500 (street)
Screen diagonal, in inches (viewable)	14 (13.1)	15 (13.8)	15 (13.8)	15 (13.8)
Processor	Pentium Pro/200	Pentium II/266	Pentium Pro/200	Pentium II/233
L2 cache	512K	512K	256K	512K
Maximum number of processors supported	1	2	1	1
Processor location	Motherboard	Motherboard	Motherboard	ZXMotherboard
Memory type	ECC	ECC	ECC	EDO
Maximum installable RAM	384MB	512MB	512MB	192MB
Motherboard manufacturer	Acer	ALR	Intel	Compaq
Chip set	Intel 82440FX	Intel 82440FX	Intel 82440FX	Intel 82440FX
Network interface cards (interface)	Intel Pro 10/100 (PCI), 3Com 10/100 Ethernet (PCI)	Adaptec ANA-6911/TX 10/100 Fast Ethernet (PCI)	Intel EtherExpress PRO/100 TX (PCI)	Integrated Netelligent Network Controller 10/100, Netelligent 10/100 PCI UTP NIC
Disk Subsystem				
Hard disk	IBM DCAS-34330	Seagate Cheetah ST34501WC	IBM DCAS-34330	Seagate Barracuda ST34371W
Hard disk capacity	4.3GB	4.6GB	4GB	4.4GB
On-board hard disk controller interfaces	2 EIDE, 1 Ultra Wide SCSI, 1 Narrow SCSI	2 EIDE, 1 Ultra Wide SCSI, 1 Narrow SCSI	2 EIDE	2 EIDE
Hard disk controllers used (interface)	Adaptec AHA-2940UW (PCI), Adaptec AIC 7880 Ultra Wide (integrated PCI)	Adaptec AIC 7880 Ultra Wide (integrated PCI)	Adaptec AIC 7880 Ultra Wide (integrated PCI)	Compaq Smart 2SL Array Controller (Wide SCSI-3)
RAID levels supported by disk controller	N/A	N/A	N/A	0, 1, 5
RAID controller channels	N/A	N/A	N/A	1
RAID controller cache (installed/maximum)	N/A	N/A	N/A	6MB / 6MB
Expandability				
Type of memory slots/number in use/total	SIMM / 4 / 6	DIMM / 2 / 4	DIMM / 4 / 4	SIMM / 6 / 6
Expansion-bus slots	4 PCI, 3 ISA	3 PCI, 2 EISA, 1 PCI/EISA	3 PCI, 2 ISA	3 PCI, 1 ISA, 1 PCI/ISA
Front-accessible drive bays (5.25"/3.5")	3 / 2	3 / 2	3 / 1	3 / 1
Internal drive bays (5.25"/3.5")	0 / 2	0 / 2	0 / 6	0 / 1
Power supply capacity wattage	200W	325W	275W	280W
Security and Fault Tolerance				
Hot-swappable drive bays in use/total	0 / 0	0 / 0	0 / 0	0 / 0
Lockable hard disk subsystem/power button/reset button	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Lockable front panel/keyboard/chassis	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Temperature sensor location	CPU, chassis	CPU, chassis	Motherboard, chassis	CPU
Server Management				
Management software	Advanced Server Manager Pro 1.2, Remote Diagnostic Manager 1.3	ALR InforManager 1.0	Intel LANDesk Server Manager Pro 2.52	Compaq Insight Manager 2.0, Compaq Smart Start
Asset management/Network management	■ ■	■ ■	■ ■	■ ■
Fault tracking	■	■	■	■
Local alert via console	■	■	■	■
Remote alert via SNMP/pager/modem	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Remote reboot	■	■	■	■
Other Hardware				
Graphics card	STB Powergraph 64	Cirrus GDM54M30	Cirrus GD54M40	Cirrus 605446-HC-A
CD-ROM drive	NEC CDR-1410A	TEAC CD-516S	Sony CDU-311	Sony/L.G. CDU571
Bootable CD-ROM drive	■	■	■	■
Service and Support				
24-hour, 7-day live technical support	■	■	■	■
Prefailure warranty coverage	None	None	Smart hard disks	ECC RAM, hard disks
Warranty (years)	1-3	3-5	3	3
On-site service charge/term	Included/1 year	\$10/1 year	Included/3 years	Included/1 year

N/A—Not applicable: The product does not have this feature.

PCs
Workgroup Servers

See www.pcmag.com for interactive views

PC MAGAZINE
EDITORS' CHOICE

Dell PowerEdge 2200	Digital Priors MX 6200	Micron Vetric LXI	S.A.G. STA Dual Pro	PC Labs Home-Brewed Special
\$5,452 (direct) 15 (13.7) Pentium II/266 512K 2 Motherboard ECC 512MB Dell Intel 82440FX Intel Pro 10/100 (PCI)	\$6,330 (street) 14 (13.4) Pentium Pro/200 512K 2 Riser card 1GB Digital Intel 82440FX Integrated 10/100 Base-T, 10Base2, AUI DE500	\$6,330 (direct) 14 (12.9) Pentium Pro/200 256K 2 Riser card 1GB Intel Intel 82440FX Integrated Intel Pro 10/100 (PCI), Intel Pro 10/100 (PCI)	\$5,241 (direct) 15 (14.3) Pentium Pro/200 512K 2 Motherboard ECC 1GB Super Intel 82440FX Intel Pila 8465B (PCI)	\$1,777 14 (13.1) Pentium/133 512K 1 Motherboard EDO 128MB Dell Intel 82437FX Intel Pro 10/100 (PCI)
Seagate Barracuda ST34371W 4.3GB 1 Ultra Wide SCSI Adaptec 2940UW (integrated PCI) N/A N/A N/A	Seagate Cheetah ST34501WC 4.6GB 1 Ultra Wide SCSI Mylex DAC960PDU (Ultra SCSI) 0, 1, 5, 6, 0 + 1 1 8MB / 64MB	Western Digital WD4360 4.3GB 1 EIDE, 1 Ultra Wide SCSI-3 Mylex DAC960PDU (Ultra SCSI) 0, 1, 5, 6, 7 2 4MB / 32MB	Seagate Cheetah ST34501WC 4.6GB 2 EIDE 2 Adaptec 2940 (Ultra Wide SCSI) N/A N/A N/A	IBM DCAS-34330 4.3GB 2 EIDE Adaptec 2940UW (PCI) N/A N/A N/A
DIMM / 1 / 4 3 PCI, 3 EISA 3 / 0 0 / 3 230W	SIMM / 4 / 8 4 EISA, 2 PCI, 1 EISA/PCI 3 / 1 0 / 0 300W	DIMM / 4 / 8 5 PCI, 2 ISA, 1 PCI/ISA 3 / 0 0 / 6 275W	SIMM, 4, 8 4 PCI, 3 ISA, 1 PCI/ISA 11 / 0 0 / 2 400W	SIMM / 4 / 4 3 PCI, 3 ISA, 1 PCI/ISA 3 / 0 0 / 2 230W
0 / 0 ■ ■ ■ ■ ■ ■ CPU	2 / 4 ■ ■ ■ ■ ■ ■ Motherboard	0 / 0 ■ ■ ■ ■ ■ ■ Fan, CPU, power supply	0 / 0 ■ ■ ■ ■ ■ ■ CPU, chassis	0 / 0 ■ ■ ■ ■ ■ ■ N/A
Hardware Instrumentation Package, Intel LANdesk Server ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Intelligent Server Management, ServerWorks Manager ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Intel LANdesk Server Manager Pro 2.52 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Intel LANdesk Server Manager Pro 2.52 ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	None N/A N/A N/A N/A
ATI Mach 64 NEC COR-1410A ■	S3 Trio Toshiba XM-5701 ■	Cirrus GD54M40 Plexor 1220-Plex ■	Matrox Millennium Sony CDU-511 ■	S3 Trio64 Sony CDU-311 ■
■ None Parts, 3; labor, 1 Included/1 year	■ None 3 Included/3 years	■ None Parts, 3; labor, 1 Included/1 year	■ Smart hard disks 2 \$70/1 year	N/A None N/A N/A

ROM drive, and power switch is secured by a lockable front panel. The two front panel LEDs indicate power, status, and memory problems.

Internally, a small rear drive bay offers valuable added storage separate from the RAID array, but it also restricts access to the four DIMM sockets. Similarly, the single 325-watt power supply isn't immediately accessible, unlike that in the Dell PowerEdge 2200 server.

ALR includes support software, Infor-Manager version 1.0, which reports on the status of devices including the CPU, power supply, and RAM, as well as ambient temperatures, voltages, and fan operations. These management capabilities are designed for NetWare and Microsoft Windows NT-based servers using Microsoft Windows 95 and Windows NT clients.

With a total of six slots (three PCI, two EISA, and one shared PCI/EISA), the Revolution 2X motherboard is loaded with embedded components—primary and secondary IDE controllers and a Cirrus Logic GD54M30 video card with 2MB of memory. Network connectivity comes in the form of 10/100 cards from the new Adaptec/Cogent alliance (EM-100). The Pentium II CPU is fitted with a CPU fan that includes speed and temperature sensors.

ALR includes a 5-year warranty for primary components and a 3-year warranty on labor and factory-installed peripherals. Toll-free technical support is available six days a week.

The ALR Revolution 2X, an excellent performer, offers great features at a reasonable price. This, plus a competitive warranty, is a hard-to-beat combination. —Mark Stanczak

Revolution 2X. Advanced Logic Research Inc., Irvine, CA; 800-444-4257, 714-581-6770; fax, 714-581-9240; www.alr.com. Circle 462 on reader service card.

AST Manhattan D6200

SPECIFICATIONS: Pentium Pro/200, IBM DCAS 34330 5,400-rpm hard disk, Intel's LANdesk Server Manager. \$5,200 street.

The AST Manhattan D6200 (\$5,200 street) is designed as an affordable workgroup server, but it doesn't provide the same level of performance as most of its competition in this roundup. The D6200, a Pentium Pro/200-based system, is not very scalable; thus while it may pass as a



Envision an enterprise that's

totally expandable,

infinitely scalable, completely compatible,

easily manageable, and entirely mobile.



Acer America Corporation and Acer Inc., Intel, the Intel Inside Logo, and Pentium are registered trademarks of Intel Corporation.

Introducing Acer's
mobile client server

solution — the new way to truly realize

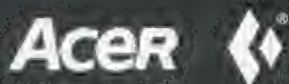
enterprise productivity.

By extending the enterprise into virtual offices, and with an increasingly mobile workforce, it becomes vital to communicate and access critical company information. Anytime. Anywhere.

Acer's Mobile Client Server solutions provide connectivity, security, mobility, accessibility, and manageability. And help you increase productivity and gain a **competitive advantage.**

As one of the world's largest personal computer and component manufacturers, Acer has state-of-the-art notebooks, desktops, and servers, like the AcerAltos™ 9000Pro server featuring dual Intel® Pentium® Pro processors. Plus, the channel relationships to optimize your solution and the resources to provide single-call service and support.

Acer's Mobile Client Server. The new enterprise solution that's definitely expandable. And ultimately the most productive.



1-800-558-ACER & select option 2, 1
www.acer.com/aacl/



With an industry leading 7-hour single battery notebook, Acer is redefining mobile solutions.



With a new Network Ready PC, Acer has a range of products that make sense.



AcerAltos servers have manageability built-in.



small workgroup file server, don't count on it to keep up as the workgroup grows in size.

With only three PCI expansion slots and two ISA slots available, the D6200 doesn't leave a lot of room for adding adapters. The Adaptec 7880 Ultra-Wide SCSI, VGA, and Intel 10/100 Ethernet adapters are all on the motherboard, though, so you don't have to use slots for those components. The case is fairly roomy for a mini-tower, so you should have no problem adding devices in the three full-height and six half-height bays.

The D6200's thoughtfully designed motherboard also includes dual in-line memory modules (DIMMs) instead of the older single in-line memory modules (SIMMs). DIMMs are smaller and allow you to add more memory without using a lot of valuable motherboard real estate.

The D6200 offers one of the best server installation and maintenance manuals of any of the products in this roundup. The 160-page manual includes detailed instructions, diagrams, and worksheets for everything from installing hard disks to changing the jumper settings on the motherboard. The reference section provides useful information such as the memory addresses, interrupts, and I/O addresses that most hardware devices use, so you can troubleshoot conflicts with any hardware you add.

Additional helpful information comes in the form of a configuration CD that you can use to boot the PC and change the hardware settings. The CD also includes a DOS-based diagnostics utility that will check your server for hardware problems such as bad memory or a failed hard disk. Unlike the AcerAltos 900Pro, the Manhattan doesn't include a CD with multiple operating systems that you can choose to install for a fee. However, some Manitans do come with a copy of Microsoft Windows NT 4.0 preinstalled.

Like the Dell and Micron servers, the Manhattan includes a copy of Intel's LANdesk Server Manager for monitoring the server from a remote location. LANdesk allows you to monitor several



For those to whom performance and growth potential are not paramount, the Manhattan has many other strengths.

of the server's parameters, including the internal temperature and the status of the cooling fans. The system doesn't include instructions for installing LANdesk, however.

AST offers free 24-hour, 7-day technical support via a toll-free number, e-mail, and Web

AST Manhattan D6200

Configuration/management	Good
Performance	Fair
Expandability/scalability	Fair
Service/support	Good

site. The server includes a three-year on-site warranty; other warranty packages are also available.

The server management is powerful and the included documentation is excellent. If performance and growth potential are not of paramount importance, you might choose the Manhattan for its many other strengths.—SR

AST Manhattan D6200. AST Computer, Irvine, CA; 800-876-4278, 714-727-4141; fax, 714-727-9355; www.ast.com. Circle 463 on reader service card.

Compaq ProSignia 200

SPECIFICATIONS: Pentium II/233, Seagate Barracuda Insight Manager 7,200-rpm hard disk, Compaq Smart Start, Compaq Net Utility. \$6,500 street. The compact size of the ProSignia 200 will appeal to the space-conscious network administrator. But that comes at the cost of some accessibility to the inner workings of this little Compaq. The ProSignia was an average performer on most of our tests.

The small footprint also limits the expandability of the ProSignia 200. The system supports a single 233-MHz Pentium II CPU and only two hard disks in the internal drive array. The three PCI slots, one ISA slot and one shared PCI/ISA slot are provided via a riser card. Memory can be expanded to 384MB of error checking and correcting code (ECC) RAM or

192MB of extended data out (EDO) RAM, which is average among our test group but nowhere near the 1GB potential of the Digital, Micron, and S.A.G. Electronics systems in this roundup. In its favor, the ProSignia 200 has an on-board auto-sensing 10/100 network adapter, but the video board and the Compaq Smart 2SL RAID controller each consume a PCI slot.

At the BIOS level, the ProSignia offers paging capabilities built into the system ROM. In addition, Compaq's Automatic Server Recovery (ASR) can reboot a hung server—a function much like ALR's Active CPR capability. These are especially useful functions if the server is locked away in a closet or located at a branch office.

Internal temperature is controlled by a single small fan that blows external air across the typically large heat sink on the Pentium II, over the adapter card cage and memory sockets. The 285-watt power supply is also fitted with a cooling fan. We saw more comprehensive cooling on other systems in this roundup.

On our benchmark tests, the ProSignia proved to be an average performer, turning in slightly better scores under Microsoft Windows NT than under NetWare. Unlike most of the competitive offerings that use Adaptec and Intel adapters, Compaq makes use of its own Netelligent network and Smart Array SCSI adapter technologies. The benefit of these Compaq components wasn't apparent on our benchmark tests.

Continuing an idea pioneered by Compaq years ago, the ProSignia offers a detailed motherboard diagram inside the access panel. This information will often be a closer and better resource than the printed manuals when you're attempting to navigate among the various switch and jumper alternatives.

Compaq includes a three-year parts-and-labor warranty



Compaq ProSignia 200

Configuration/management	Good
Performance	Fair
Expandability/scalability	Fair
Service/support	Excellent

The Compaq ProSignia offers competitive features and performance at the highest price in the roundup.

BOLD POWERFUL AFFORDABLE

Akia Mystique Series

Distinctly Different Computing



Monitor sold separately.

New Akia Mystique M166

166 MHz Pentium® Processor
with MMX™ Technology

- 32MB SDRAM
- 512K Pipeline Burst Cache
- 3.2GB Enhanced IDE Hard Drive
- 16X CD ROM
- 3.5" Diskette Drive
- 2MB 64-bit PCI Graphics*
- 16-bit Stereo Sound System
- LAN 10/100 Base TX Ethernet
- Universal Serial Bus connections
- IrDA 1.1 Standard Compliant
- Industry Standard Keyboard & Mouse
- Microsoft Windows® 95 Pre-installed

\$1599

(S3498 with 14.5" Active Matrix Monitor)

New Akia Mystique M233

233 MHz Pentium® Processor
with MMX™ Technology

- 32MB SDRAM
- 512K Pipeline Burst Cache
- 4.0GB Enhanced IDE Hard Drive
- 16X CD ROM
- 3.5" Diskette Drive
- 4MB 3D 64-bit PCI Graphics*
- 16-bit Stereo Sound System
- LAN 10/100 Base TX Ethernet
- Universal Serial Bus connections
- IrDA 1.1 Standard Compliant
- Industry Standard Keyboard & Mouse
- Microsoft Windows® 95 Pre-installed

\$1999

(S3998 with 14.5" Active Matrix Monitor)



akia

COMPUTER CORPORATION

TO ORDER TOLL FREE

800-936-5481

Minimum Order of \$1000.00

*Data Support Panel, Rear I/O Ports, 100MHz EISA
Customization Available on request
*Not for sale in the US

24-hour customer service and support
throughout the world

P.O. Box 80089
Austin, Texas 78708-0089
FAX: 512/339-4806

Akia Tornado Series

The Ultimate in Power Notebooks

Ultra Slim – Weighing Less than 5-1/2 lbs.

POWER FLEXIBILITY TECHNOLOGY



New Akia Tornado TS200

200 MHz Pentium® Processor
With MMX™ Technology

- 12.1" SVGA Active Matrix Display
- 32MB RAM (128MB Max.)
- 256K L2 Pipeline Burst Cache
- 2.1 GB Hard Drive
- 20X max variable CD ROM*
- FlexaBay accepts 20X max variable CD ROM, 3.5" Floppy (included) or Optional 2nd Lithium Ion Battery Pack
- PCI Bus with 128-bit Graphics Accelerator
- Stereo Sound System
- Smart Lithium Ion Battery
- Microsoft Windows® 95 Pre-installed
- Integrated TouchPad

Available Options:

- 2nd Lithium Ion Battery Pack
- 32MB Memory Module
- 33.6 Fax Modem

\$3499

*20X max./11X min.

New Akia Tornado TX233

233 MHz Pentium® Processor
With MMX™ Technology

- 13.3" XGA Active Matrix Display
- 64MB RAM (128MB Max.)
- 256K L2 Pipeline Burst Cache
- 3.0 GB Hard Drive
- 20X max variable CD ROM*
- FlexaBay accepts 20X max variable CD ROM, 3.5" Floppy (included) or Optional 2nd Lithium Ion Battery Pack
- PCI Bus with 128-bit Graphics Accelerator
- Stereo Sound System
- Smart Lithium Ion Battery
- Microsoft Windows® 95 Pre-installed
- Integrated TouchPad

Available Options:

- 2nd Lithium Ion Battery Pack
- 33.6 Fax Modem

\$4599

*20X max./11X min.



akia

COMPUTER CORPORATION

TO ORDER TOLL FREE

800-936-5481

Visit our Website at www.akia.com

Sales Support Hours: Mon-Fri 8am - 6pm (CT)

Customer Support Available 5 day a week

(Mon - Fri: 8am - 6pm CT)

30 day unconditional money-back guarantee
from date of shipment

P.O. Box 80889

Austin, Texas 78708-0889

FAX: 512/339-4886

Akia LCD Monitors

See What You'll Be Missing



TYPICAL 17" CRT MONITOR
(TYPICAL VIEWABLE IMAGE SIZE - 15")

**A Significantly Smaller Footprint than the Typical 17" Monitor
with the Brilliant Image Quality You Expect**

Akia MP145 MONITOR

- 14.5" Active Matrix Color LCD Monitor
- 14.5" Viewable Image Size
- Compact Footprint (HWD) 15.4" x 15.7" x 8.3"
- 1024 x 768 Pixel Resolution (scalable for lower resolutions)
- 75Hz with 262,144 Colors
- Super Bright with 100:1 Contrast Ratio
- High Performance Digital Interface
- Comprehensive Driver Support

\$1899

Akia MR145 MONITOR

- 14.5" Active Matrix Color LCD Monitor
- 14.5" Viewable Image Size
- Compact Footprint (HWD) 15.4" x 15.7" x 8.3"
- 1024 x 768 Pixel Resolution (scalable for lower resolutions)
- 75Hz with 262,144 Colors
- Super Bright with 100:1 Contrast Ratio
- Industry Standard Analog RGB Interface
- Energy Efficient and Compliant with DPMS and DDC2

\$1999

Akia Computer Corporation is committed to bring you the best available technologies in a unique and distinct way. Our growing family of products includes market leading LCD Monitors, Micro Footprint Desktops, and the Ultimate High Performance Notebooks.

Purchase with confidence knowing that each system will be carefully inspected, tested, and personally configured. Back this up with toll-free customer support that is there if you need it. And, of course a One-year limited warranty and unconditional 30 day money back guarantee.

*Akia Computer Corporation is not responsible for omissions or errors in typography or photography. Prices and specifications subject to change without notice. Prices do not include shipping and handling and any applicable taxes. 30-day money back policy does not include return freight and original shipping/handling charges. The Intel Inside logo, and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. MS, Windows and Windows logo are registered trademarks of Microsoft Corporation.
CIRCLE 054 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink
©1997 All Rights Reserved. Akia is a trademark of Akia Computer Corporation.

akia

COMPUTER CORPORATION

TO ORDER TOLL FREE

800-936-5481

Sales Support Hours: Mon-Fri 8am - 6pm (CT)
Customer Support Available 5 day a week
(Mon - Fri: 8am - 6pm CT)

30 day unconditional money-back guarantee
(from date of shipment)

P.O. Box 80889
Austin, Texas 78708-0889
FAX: 512/339-4886

for carry-in and second-business-day on-site service (within 60 miles of an authorized service center) with an optional 4-hour priority service level. Lifetime hardware technical support is also part of the standard warranty.

At \$6,500, the ProSignia charges a premium for the privilege of having the Compaq nameplate on your server. Compared with competitive offerings from ALR and Dell, the ProSignia 200 doesn't match up in performance and scalability. —MS

ProSignia 200. Compaq Computer Corp., Houston, TX; 800-345-1518, 281-370-0670; fax, 281-518-1442; www.compaq.com. Circle 464 on reader service card.

Dell PowerEdge 2200

SPECIFICATIONS: *Pentium II/266, Seagate ST34371W (Barracuda) 7,200-rpm hard disk, Hardware Instrumentation Package and Intel LANDesk Server Manager. \$5,452 direct.*

The Dell PowerEdge 2200 offers an impressive mix of efficient design and rock-solid performance that is powerful enough to support a small client/server environment or an Intranet server. The PowerEdge 2200 is the stronger twin of the Pentium Pro-based model 2100. The PowerEdge can be upgraded to dual processors like most of the others, but it cannot be equipped with a removable disk array.

On our benchmark tests, the PowerEdge fared especially well running the NetWare operating system in both NetBench and WebBench benchmark test suites. The unit suffered in our ServerBench application server tests at high client loads.

Internally, the motherboard design includes three PCI slots and three EISA slots, none of which are shared. The embedded ATI mach64 video and Adaptec 7880 Ultra-Wide SCSI components are good, but onboard FastEthernet would set the PowerEdge apart from its nearest price/performance competitors. Advanced Logic Research and S.A.G. To the PowerEdge's advantage, all devices connect onto the same edge of the motherboard, which has been engineered to drop out, mak-

ing full replacement a snap. Even the 230-watt power supply is easily replaceable.

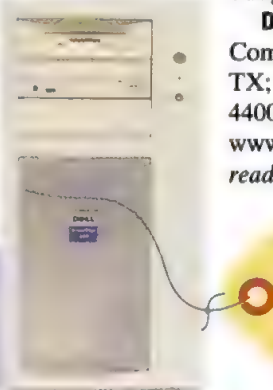
For server management, Dell offers the Hardware Instrumentation Package (HIP), which includes the LANDesk Server Manager version 2.52 hardware/software package from Intel. Similar LANDesk components are also used by Micron and AST.

Attached to each Pentium II processor module is a large heat sink with a built-in thermal sensor. Wires connect the sensor to the motherboard, where LANDesk agents monitor the status of these critical components and, with the \$99 optional Dell Remote Assistant Card, can send alerts via fax, pager, and email.

The documentation included with the PowerEdge 2200 is outstanding. The large, two-color diagrams clearly identify jumper locations and their settings. Hardware upgrade procedures were well outlined, and issues pertinent to both NetWare and Microsoft Windows NT installations are also covered in detail. A diagnostic CD included with the system can be run from the bootable 8X CD-ROM drive, and the full set of system utilities and manuals are also on the CD.

Dell's service reputation is outstanding, and the PowerEdge 2200 comes with a lifetime 24-hour, 7-day phone support for the hardware and a full year of next-day, on-site service. This system is ideal for a small workgroup with a limited budget. —MS

Dell PowerEdge 2200. Dell Computer Corp., Round Rock, TX; 800-289-3355, 512-338-4400; fax, 800-727-8320; www.dell.com. Circle 465 on reader service card.



Dell PowerEdge 2200

Configuration/management	Good
Performance	Good
Expandability/scalability	Good
Service/support	Good

The Dell PowerEdge 2200 is ideal for a small workgroup with a limited budget.

Digital Prioris MX 6200



SPECIFICATIONS: *Pentium Pro/200, Seagate Cheetah 10,000-rpm hard disk, ServerWorks Manager and Intelligent Server Management. \$6,330 street.*

Most of the servers in this roundup, such as the units from AST, Acer, Hewlett-Packard, and Micron, are designed for workgroup-size networks of less than 50 clients. The Editors' Choice Digital Prioris MX 6200 starts out as a small workgroup solution, but it can easily grow to act as a powerful departmental server for 200 clients. You do pay a significant

\$6,330 (street) for this power, and for the ease of use that Digital builds into it.

You can replace the unit's current Pentium Pro CPU with up to two Pentium II processors

Digital Prioris MX 6200

Configuration/management	Excellent
Performance	Good
Expandability/scalability	Excellent
Service/support	Excellent

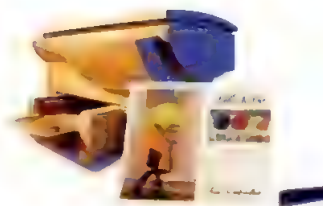
The Digital Prioris MX 6200 packs a lot of power and plenty of room to grow, along with a great warranty.

without switching motherboards, thanks to a special Digital design. (ALR offers the same feature.) The system's scalability is also evident in excellent management capabilities, seven expansion slots, four drive bays, hardware RAID, onboard Ultra SCSI and 10/100-Mbps Ethernet adapters, and maximum of 1GB of ECC RAM. The Prioris's case design makes it extremely easy to add and remove components. Two powerful, variable-speed fans, plus another in the 300-watt power supply, help to keep the large chassis cool.

The unit was a good performer on most of our tests, helped by a caching RAID controller and fast SCSI Seagate Cheetah drives. The Digital server's only weakness was in supporting a Web environment.

The Quick Launch guide and CD make it easy to set up your hardware and the OS on the Prioris. The guide provides helpful diagrams and instructions for con-

IN A SMALL BUSINESS, IT'S JUST YOU AND
YOUR WORK.



But there's help.

Introducing the HP OfficeJet Pro 1150C.

It prints.

It copies.

It scans.

All-in-One.

All-in-Color.

All for \$899*.



Visit us at www.hp.com/go/officejet-pro

*Estimated U.S. retail price.



At ProGen, competitive-edge pricing meets on-the-edge performance.



Polaris Featuring Intel Pentium® II Processor

Common features: 512KB Integrated L2 Cache, NEW 24X EIDE CD-ROM Drive, PCI 32 bit 3D Stereo Wavetable Audio Subsystem, MS Mouse, Win95 KB, 1.44MB FDD, 2 Universal Serial Bus (USB) Ports, Super CD Bonus Pak, Microphone w/ Stand, ProGen ProCare Warranty, 3-Year Limited Parts + 1-Year On-Site.

233MHz Pentium® II Processor

- ▶ Intel 440LX AGP Chipset
- ▶ 32MB EDO DRAM
- ▶ 4.3GB EIDE Hard Drive
- ▶ Panasonic 15" (14" v.i.s.) .27dp Digital PnP Monitor
- ▶ AGP Video Graphic Card, 4MB VRAM, upgradeable to 8MB VRAM
- ▶ 56K Ready Telephony Modem
- ▶ Amplified Stereo Speakers
- ▶ MS Windows NT Workstation v.4.0

\$2189

266MHz Pentium® II Processor

- ▶ Intel 440LX AGP Chipset
- ▶ 32MB EDO DRAM
- ▶ 5.1GB Fast EIDE Hard Drive
- ▶ ProGen 17" .28dp Digital PnP Monitor
- ▶ 33.6K Telephony Modem
- ▶ AGP Video Graphic Card, 8MB VRAM
- ▶ Subwoofer Sound System w/Amplified Stereo Speakers
- ▶ MS Windows 95

\$2569

266MHz Pentium® II Processor

- ▶ Intel 440FX PCI Chipset
- ▶ 64MB EDO DRAM
- ▶ NEW 6.4GB EIDE Hard Drive
- ▶ Panasonic 17" (16" v.i.s.) .27dp Digital PnP Monitor
- ▶ Iomega Zip 100MB IDE Internal Drive w/One Cartridge
- ▶ Diamond Stealth 3D 4MB VRAM Video Graphic Card
- ▶ 56K Ready Telephony Modem
- ▶ Subwoofer Sound System w/Amplified Stereo Speakers
- ▶ MS Windows NT Workstation v.4.0

\$2649

We at ProGen Systems have built our success on what we call the partnership of performance and price. It's a way of doing business that works for us. And it works for you, too.

That's because we build-in the latest industry advances, including genuine **233MHz Intel Pentium® Processors** with **MMX™** technology, **3D MPEG** video graphic acceleration, a **Subwoofer Sound System** and the new **24X CD-ROM** drives, and offer them to you at highly competitive prices.

Backed by the ProGen ProCare **3-year limited warranty, free tech support and on-site service**, our systems offer unsurpassed performance, reliability and value.

Whether you're looking for a business professional, corporate or multimedia solution, ProGen has the system for you at a price that works for your budget. So call a ProGen consultant today, or visit our **on-line order** web site at **www.progen.com**, and put ProGen to work for you.



Discover 3D

Intel 200MHz Pentium® Processor with MMX™ Technology

- ▶ 512K Pipelined Burst Cache
- ▶ ProGen 15" .28dp Digital PnP Monitor
- ▶ ProGen GOLD 3D (S3 Virge) 4MB EDO DRAM, MPEG
- ▶ 16X EIDE CD-ROM Drive
- ▶ 33.6K Telephony Modem
- ▶ 3D Stereo Wavetable Audio Subsystem, complete with Amplified Stereo Speakers
- ▶ MS Windows 95/Hi-Res Mouse
- ▶ 1.44MB FDD/Win95 KB
- ▶ Home Office Suite 97, Infopedia Educational CD and 3 Exciting Games Pak, Microphone w/ Stand
- ▶ ProGen ProCare Warranty (3 Year Limited Parts & 1 Year On-site)

166MHz Pentium® Processor w/MMX™ Technology
16MB EDO DRAM, 2.5GB Fast EIDE HDD

\$1049

200MHz Pentium® Processor w/MMX™ Technology
32MB EDO DRAM, 3.2GB Fast EIDE HDD

\$1219

233MHz Pentium® Processor w/MMX™ Technology
32MB EDO DRAM, 4.3GB Fast EIDE HDD

\$1399

*Add a Desktop Camera, video capture, motion video, for \$199.

Introducing the powerful new ProGen Daytona™ series of Notebook Computers, featuring the Genuine Intel Mobile Module.

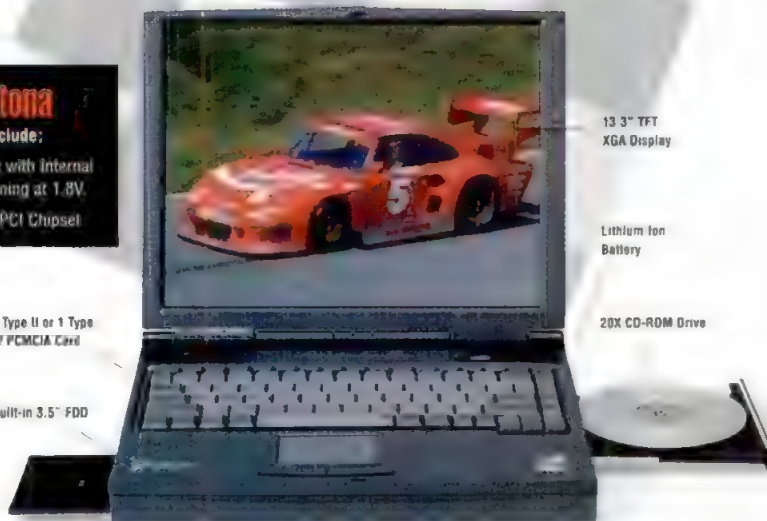
The ProGen Daytona series takes the lead on the notebook price/performance track with the power of the latest Intel 200MHz and 233MHz Pentium® Processor with MMX™ Technology. These state-of-the-art systems take their competitive edge even further with the genuine Intel Mobile Module and internal 512K L2 Cache, running at 1.8V.

By using the Intel Mobile Module, ProGen Daytona notebook computers enjoy a definite advantage over other notebook computers built around lower-cost desktop CPUs, which can significantly increase power consumption, reduce battery life and slow performance by as much as 50%!



2 Type II or 1 Type IV PCMCIA Card

Built-in 3.5" FDD



13.3" TFT XGA Display

Lithium Ion Battery

20X CD-ROM Drive

ProGen Daytona™ Series

Standard features:

- ▶ 13.3" TFT Active Matrix XGA Display
- ▶ Intel Mobile Module with Internal 512K L2 Cache Running at 1.8V
- ▶ Intel 430TX Mobile PCI Chipset
- ▶ PCI Bus with 64-bit 3D Graphic Accelerator, 4MB SGRAM
- ▶ 20X CD-ROM Drive
- ▶ ALPS Touch Pad Pointing Device
- ▶ 16-bit SoundBlaster Pro Compatible Stereo sound (supports 3D sound and wavetable)
- ▶ Built-in Stereo Speakers and Microphone
- ▶ Infrared Module (including Utility) Supports FIR
- ▶ CardBus and Zoomed Video Ready
- ▶ NTSC-video
- ▶ Built-in 3.5" FDD, 2 Type II or 1 Type III PCMCIA Slot
- ▶ Lithium-Ion Battery/AC Adapter
- ▶ Mobile Car Adapter
- ▶ Carrying Case
- ▶ Microsoft Windows 95
- ▶ 1 Year Limited Parts and Labor Warranty

200MHz Intel Pentium® Processor w/MMX™ Technology, 1.8V

- ▶ 512K Internal L2 Cache, 2 1GB HDD, 16MB SO DIMM, PCMCIA 33.6K bps Fax/Modem **\$3649**
- ▶ 512K Internal L2 Cache, 2 1GB HDD, 32MB SO DIMM, PCMCIA 10BaseT Ethernet Card **\$3749**
- ▶ 512K Internal L2 Cache, 3GB HDD, 32MB SO DIMM, 56K bps PCMCIA Fax/Modem **\$3999**

233MHz Intel Pentium® Processor w/MMX™ Technology, 1.8V

- ▶ 512K Internal L2 Cache, 3GB HDD, 32MB SO DIMM, PCMCIA 33.6K bps Fax/Modem and Ethernet 10BaseT Combo Card **\$4249**
- ▶ 512K Internal L2 Cache, 3GB HDD, 64MB SO DIMM, PCMCIA 56K bps Internal Fax/Modem **\$4399**

Daytona Upgrade Options

- Port Replicator **\$ 59**
- Additional Lithium-Ion Battery (with system purchase) **\$200**
- Call for various carrying cases



1-800-848-1353

Sales Hours: M-F, 9:30 A.M. - 7:00 P.M. PST • Sat., 9:00 A.M. - 3:00 P.M. PST

Technical Support: 1-888-777-6501 • Customer Service: 1-800-848-8787

Customer Service/Technical Support Hours: M-F, 9:00 A.M. - 6:00 P.M. PST

ProGen™ Technology Inc. 15501 Redhill Avenue, Tustin, CA 92780 Ph: 714/566-9200 Fax: 714/566-9267

BBS: 714/566-9255 E-Mail: webmaster@progen.com.

©1997 ProGen™ Technology Inc. Intel Inside logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other trademarks are the property of their respective owners. Prices are subject to change without notice. * On site service is based on the discretion of ProGen technical support. Leasing Rate will vary depending on state legislation, and is intended for business or corporate use only. 30-day money-back Guarantee (shipping cost not included). Actual products may be different from products in photo.

CIRCLE 287 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

ProGen™

Works for You.
www.progen.com

VISIO

Visualize your business™



It only takes a moment
with Visio to discover
a more productive
use of your time.

New version

5.0

You understand the power of communicating ideas graphically. And the right tool makes complex ideas clear to everyone in your organization. The wrong tool leaves too much to interpretation. Because Visio® Standard 5.0 offers a complete toolbox with over 1,300 SmartShapes® symbols, you can be sure your ideas are expressed succinctly whether you use flowcharts, project timelines or any business diagram. And since Visio technology seamlessly integrates with the Microsoft Office environment you already know, you'll be able to represent the information that describes your business in less time than you can say "org chart." Want to share the drawing with the rest of your team or branch offices around the world? Just email the Visio drawing or post it on your intranet site and everyone will be on the same page. To find out how you can dynamically communicate throughout your organization with Visio Standard 5.0 and other Visio products, call 1-800-24-VISIO ext. A021 or visit www.visio.com/standard.

© 1997 Visio Corporation. All rights reserved. Visio, the Visio logo, the Visualize your business logo, and SmartShapes are either trademarks or registered trademarks of Visio Corporation in the United States and/or other countries. All other trademarks, trade names or company names referenced herein are used for identification only and are the property of their respective companies.

Flowcharts



Workgroup Servers

necting all the cables. The CD includes configuration and diagnostics utilities as well as software for the optional Mylex caching 8MB RAID controller (a \$1,000 card, included in the above price). You can use the CD to install common NOSs including NetWare and Windows NT, or to create disks for other operating systems such as SCO Unix and OS/2.

The bundled ServerWorks management software gathers both SNMP and Desktop Management Interface (DMI) information from Digital servers and other compliant devices on the network. ServerWorks lets you monitor the processor, disks, network utilization, server temperature, and the condition of fans and power supplies; you can also track any RAM errors. If an error condition appears, ServerWorks will automatically page an administrator.

You can configure ServerWorks to report on devices in different colors for proper operation and for errors. You can also set alarms to a minimum threshold for basic problems such as a failed hard disk or fan as well as for information such as the number of network packets sent and received.

Digital packs a lot of power into the Prioris MX 6200 and plenty of room to grow. The company also backs the Prioris with one of the best warranty packages in this roundup: 24-hour, 7-day technical support and a three-year warranty that includes on-site service.—SR

Digital Prioris MX 6200. Digital Equipment Corp., Maynard, MA; 800-344-4825, 508-493-5111; fax, 508-480-8583; www.window.digital.com. Circle 466 on reader service card.

Micron Vetix LXI

SPECIFICATIONS: Pentium Pro/200, Western Digital WD4360 7,200-rpm hard disk, Intel LANDesk Server Manager. \$6,330 direct.

At first glance, the Micron Vetix LXI workgroup server looks like any other small workgroup server. After all, Micron expanded into the server market only in the past year. But when you pop the hood, which requires a screwdriver, you'll prob-

ably be impressed. The Vetix contains a lot of powerful features in a small area, including a Pentium Pro/200 with room for another, eight DIMM slots for up to 1GB of ECC RAM, seven expansion slots, and nine drive bays.

That's the good news. In terms of performance, the Vetix stayed near the bottom of the pack on most of our benchmark tests. The Vetix's power is at best worthy of a small workgroup file server, nothing more.

Like other products, including the Digital Prioris MX 6200, the Vetix saves room inside the case by embedding several components on the motherboard: 10/100-Mbps Intel EtherExpress, 1MB video card, and Adaptec AHA7880 SCSI adapter. The server also has a fast 12X-20X CD-ROM, which may seem a little overkill for a server, but it does make installing the NOS much faster. The unit we tested also included an optional Mylex DAC960 RAID controller.

The Vetix package includes a configuration CD, server manual, and the LANDesk



Micron Vetix LXI

Configuration/management	Good
Performance	Fair
Expandability/scalability	Fair
Service/support	Good

The Vetix was not a good performer, but it offers all the documentation, expandability, and support you could ask for.

product, complete with software and documentation. The configuration CD allows you to boot the server, change settings on all of the on-board components, and run diagnostics. The server manual gives detailed instructions for installing most of the major OSs and some useful troubleshooting tips. The CD does not provide a utility to create driver disks for these NOSs. However, most Micron servers, like our test unit, are sold with the NOS preinstalled and configured.

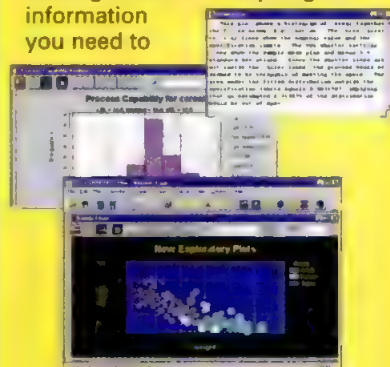
Like the AST and Dell machines, the Vetix depends on LANDesk to monitor (either locally or remotely) server statistics such as ambient temperature, voltage, ECC memory, and even whether the case is unlocked. The LANDesk interface is

If you find yourself talking to your statistical analysis program, try one that talks to you.

STATGRAPHICS[®] Plus for Windows[®]

Some statistics programs are so difficult to use that you just can't help talking to them — and not always in the most polite manner.

STATGRAPHICS[®] Plus talks to you, providing instant, insightful interpretations of your results and making it fast and easy to get the information you need to



make better, more informed decisions. Our user-friendly menus step you through more than 150 different statistical procedures, and our exclusive StatFolio feature allows you to instantly update your analyses for periodic forecasts and reports.

With the base system or any of our five optional modules, let STATGRAPHICS[®] Plus do the talking with boss-pleasing, attention-getting reports and presentations.

But enough with the talking.

**800-592-0050
ext. 200**

Outside the U.S. **301-984-5412**

www.statgraphics.com

CIRCLE 365 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink

Copyright © 1997 by STATGRAPHICS, Inc. All rights reserved. STATGRAPHICS, the STATGRAPHICS logo, and the STATGRAPHICS Plus logo are registered trademarks of STATGRAPHICS, Inc. in the U.S. and other countries. Windows is a registered trademark of Microsoft Corporation.

STEVE JORDAHL

IS Analyst and Developer
McDonnell Douglas

Steve Jordahl is a hands-on guy. As MIS specialist and computer decision-maker for McDonnell Douglas, Steve works with people on the cutting edge of today's (and tomorrow's) aerospace technology. Whether they're designing science fiction-like space vehicles, logging flight data, or storing all kinds of top-secret stuff, the people who rely on Steve need space. Big space. Which is what they get when he hooks them up with a Jaz® drive.

So while the people in Steve's division work with space daily, when they need more of it, they rely on handy, removable Jaz disks.

Check out why McDonnell Douglas was among the first Jaz users at www.4inchesquare.com/pmg.



Super-Fast, Extremely Vast
PERSONAL HARD DRIVE.



"How we fit one interstellar launch vehicle,
a few thousand flight hours, and reams
of highly sensitive information into a
4 INCH SQUARE."



BECAUSE IT'S YOUR STUFF.™

© 1997 iomega Corporation. iomega, the iomega logo, and Jaz are registered trademarks, and "Because It's Your Stuff" is a trademark, of iomega Corporation. All other trademarks are property of their respective holders. The views expressed herein are the views of the endorser and are not the views of, and do not constitute an endorsement by, any person or firm for whom the endorser has provided services.

easy to use, and the only requirements are that you use the TCP/IP network protocol to communicate and manage a server running Microsoft Windows NT and the IPX protocol for NetWare.

Micron provides free technical support 24 hours, seven days. The server also includes a three-year warranty on the entire system and a five-year warranty on the CPU and RAM. The first year includes next-day on-site service. A nice addition is the NOS software support, which lets you ask questions about your software three times in the first year at no charge; most server vendors don't provide free technical support for software problems.

If you can overlook its comparative poor performance, the Vetix has all the documentation, expandability, and support you could ask for.—SR

Micron Vetix LXI. Micron Electronics Inc., Nampa, ID; 888-634-8799, 208-893-3343; fax, 208-893-3424; www.micron-pc.com. Circle 467 on reader service card.

S.A.G. STA Dual Pro

SPECIFICATIONS: Pentium Pro/200, Seagate Cheetah 10,000-rpm hard disk, Intel LANDesk Server Manager. \$5,241 direct.

The S.A.G. STA Dual Pro's concept of small workgroup servers is in sharp contrast to that of the Compaq ProSignia 200: The STA Dual Pro is nearly double-tall and double-wide compared with an average tower case. The system is also sturdy and fairly secure, with a pair of lockable front panels that hide the power switch and all disk drives.

The STA Dual Pro, running a single Pentium Pro/200 with 512K of L2 cache, was one of the top performers in file-serving and client/server environments on our tests, especially at higher client loads. This is largely due to the vendor's selection of 10,000-rpm Seagate Cheetah disk drives for our test unit. The higher rotational speed means increased data throughput when client requests can't be satisfied out of disk cache and must hit the physical drive. The ALR Revolution 2X and the Digital Prioris MX 6200 had the only other 10,000-rpm drives; the other sys-

tems in this roundup used 7,200-rpm or slower drives.

With so much space to work with, the STA Dual Pro led the league with its 13-disk capacity—seven disks in the storage array, and two 3.5-inch and four 5.25-inch drive bays. This creates a huge potential appetite for I/O and power, so the unit arrived with a pair of Adaptec 2940 Ultra-Wide SCSI controllers and a 400-watt power supply. Two independent pairs of fans cool the drive and CPU/memory areas. Of course, all this heavy hardware comes on wheels. Some of this may be overkill for a workgroup server, but S.A.G. was able to keep the cost

S.A.G. STA Dual Pro

Configuration/management	Fair
Performance	Good
Expandability/scalability	Excellent
Service/support	Fair

The S.A.G. STA Dual Pro offers a speedy hard disk and seemingly endless expandability for a rock-bottom price.

in line with most of the others in this review.

As the name implies, the STA Dual Pro can be expanded to include a second Pentium Pro processor, but it can't be upgraded to the Pentium II. The motherboard is large enough that the processors mount directly rather than on daughter cards. Eight banks of memory sockets allow the STA Dual Pro to support up to 1GB of RAM, just enough to satisfy Microsoft Windows NT's thirst. Oddly, the keyboard port is the older, AT-style converted to DIN with a small \$2 plug.

The S.A.G. system is generally built with quality components: ultra-wide SCSI controllers from Adaptec and Intel Pro/100B network adapters. As with the Dell, AST, and Micron systems, LANDesk Server Manager is included to provide remote status monitoring and alert functions for internal conditions.

Documentation is sparse, with little more than a simple user's manual for the Super P6DNF motherboard. Each of the other major components, such as the disk controllers, has its own documentation.

S.A.G. offers round-the-clock toll-free telephone technical support and a two-



4-inch, 1 gig Jaz cartridges
for as low as \$89.95.*

HIGH-PERFORMANCE BACKUP

- Back up one gig in as little as 10 minutes
- Free 1-Step™ backup software backs up as much as 2 gigs (compressed)
- Run your entire system straight from your Jaz® drive to instantly recover from hard disk crashes

HIGH CAPACITY MEETS INSTANT ACCESS

- Run applications and files straight from disk
- Access time: 15.5ms read/17.5ms write
- Average seek time: 10ms read/12ms write
- Sustained transfer rate: 6.62MB/sec. max
- MTBF: 250,000 hrs.

HUGE FILES TO GO

- 1-gigabyte 4-inch disks fit in your pocket
- Portable external drives fit easily in your briefcase—internal drives also available
- Traveller and Jaz Cards make laptop use easy

PC AND MAC COMPATIBLE

- Windows 95, NT, and 3.X, Mac, DOS, OS/2
- IRIX and Solaris also available from Rorke Data

HOW TO CONNECT:

- Jaz Jet™ SCSI PCI \$99
- Jaz Jet SCSI ISA \$89
- Jaz Traveller (Parallel Port) \$49
- Jaz Card (PCMCIA) \$125

VISIT WWW.IOMEGA.COM
or see your reseller.



\$399 EXTERNAL



*When purchased in multi-packs. Prices listed are estimated street prices. Actual prices may vary. 1-Step and Jet are trademarks of Iomega Corporation. Windows 95 and Windows NT are trademarks of Microsoft Corporation. Mac OS is a trademark of Apple Computer, Inc. All other trademarks are property of their respective holders.

Get a DOWN LOAD of this.

w
w
w
.
p
c
m
a
g
.
c
o
m

250 FREE DOWNLOADS
(to be precise)



PCs Workgroup Servers

year parts-and-labor warranty, but the vendor charges \$70 for a year of on-site service. The STA Dual Pro offers a speedy hard disk and seemingly endless expansion opportunity for a rock-bottom price.—MS

S.A.G. STA Dual Pro. S.A.G. Electronics Inc., North Andover, MA; 800-989-3475, 508-683-0339; fax, 508-689-0180. www.sag-elec.com. Circle 468 on reader service card.

"PC Labs Home-Brewed Special"

SPECIFICATIONS: Pentium/133, IBM DCAS-34330 5,400-rpm hard disks, no server management. \$1,777 (price of hardware only).

Just how well would a homebuilt desktop-turned-server fare against new workgroup servers in a head-to-head competition? To find out, we took a Pentium/133-based Dell Dimension XPS, loaded Microsoft Windows NT 4.0, stuffed it full of the same high-octane disk storage and networking components as found on some of the other units in this roundup, and tested it under the same conditions. We priced the system based on the components we added: 128MB of RAM, two hard disks, two network cards, and a hard disk controller.

The bottom line is just that, the bottom line: The PC Labs Home-Brewed Special was the outright loser on all three benchmark test suites. It almost kept pace with the pack at up to four clients, which means it can handle 15 to 20 users without intolerably poor performance. Ultimately, however, the other machines show two to three times the transaction capacity on ServerBench, nearly three times the throughput on NetBench, and almost four times the client load capacity on WebBench.

Aside from the obvious performance advantages of a new system, PC Labs Home-Brewed Special-type systems are very difficult to support. When you're making various upgrades as needed, pinpointing a problem can be tedious and costly. What starts with a misplaced manual often ends up as an expensive call to a lucky server technician.

Expandability is another area where the PC Labs Home-

Brewed Special doesn't measure up. Fitting two data drives in addition to the standard floppy and CD-ROM drives and increasing the memory to 128MB completely stuffed the poor XPS. The mesh of cables left by our upgrades made any future entry into the system hazardous duty. The new servers are surprisingly tidy thanks to better cable management and fewer components, and the units offer plenty of space and power feeds for additional drives. Even better, their more modular designs enable entire disk arrays to be removed for servicing and upgrades.

Furthermore, at the rate operating systems are consuming memory, 128MB of RAM may be tomorrow's minimum requirement. The new small workgroup servers may use many of the same components as the PC Labs Home-Brewed Special, but the manufacturer becomes your single source of hardware support. Many of these new systems can report their exact configuration for analysis by factory-trained technicians.

Destined to fail? Clearly a lowly 133-MHz Pentium is going to have a hard time keeping up with 200- to 266-MHz Pentium Pro and Pentium II CPUs. But we wanted to show that if you're hesitant to drop about \$6,000 on new server, you can push the limits of your existing hardware by building up the disk subsystem and memory. When all is said and done, you'll have spent half as much and probably extended the life of an "old" PC by at least a year. Failing that, a 133-MHz processor is still a viable desktop CPU given enough memory.

Thus, a PC Labs Home-Brewed Special is a viable temporary or short-term solution for a very small workgroup. If you foresee any growth in your company, however, you will be better served by one of the other units in this roundup.—MS 



PC Labs Home-Brewed Special

Configuration/management	Poor
Performance	Poor
Expandability/scalability	Poor
Service/support	N/A

You could build your own PC Labs Home-Brewed Special, but we recommend it only as a short-term solution.

Philips Brilliance® Monitors
bring out your best.



BRILLIANCE®
HIGH RESOLUTION MONITORS

Philips Brilliance monitors bring out your best on the PC screen with pixel perfect display plus incredibly high resolution, color, accuracy, contrast and consistency. They're available in 15", 17", and 21" inch sizes. So, whether you're a design professional, office or small business user, or serious game player, we have the right size monitors for you. Look into a Philips Brilliance monitors today.

BU Monitors Website: [www: http://www.monitors.be.philips.com](http://www.monitors.be.philips.com) or fax
Europe: 31-40-273-5412 USA: 1-770-821-2228 Asia Pacific: 852-2-866-7358
CIRCLE 021 ON READER SERVICE CARD



PHILIPS

Let's make things better



IT'S VERY WELL
MADE IN TAIWAN

The Winning Product
EH2045S

Accelerate your network with Accton's Ethernet Hubs, Cards, and Cables

You want Accton's reliable solution for your network, and it comes with the combination of our Ethernet Hubs, Cards, and Cables.

Accton has designed a solution built from the ground up to meet the networking needs of growing companies like yours. You get speed, ease-of-use and flexibility, all at a surprisingly low cost.

Accton's GroupLAN™ includes all the networking components you need to easily set up a simple LAN configuration. Plug Accton's PnP MPX2 adapters into your PCs, connect each PC to the Smart hub with UTP cabling and you have a starter LAN up and running in your office.

Accton's Smart hub also allows you to expand to four additional Accton Smart hubs with daisy chain.

To learn more about Accton's solutions for your networking demands, visit our website at:

<http://www.accton.com>



Accton Technology Corporation

International Headquarters No. 1 Creation Rd. III, Science-based Industrial Park,

Hsinchu 300, Taiwan R. O. C.

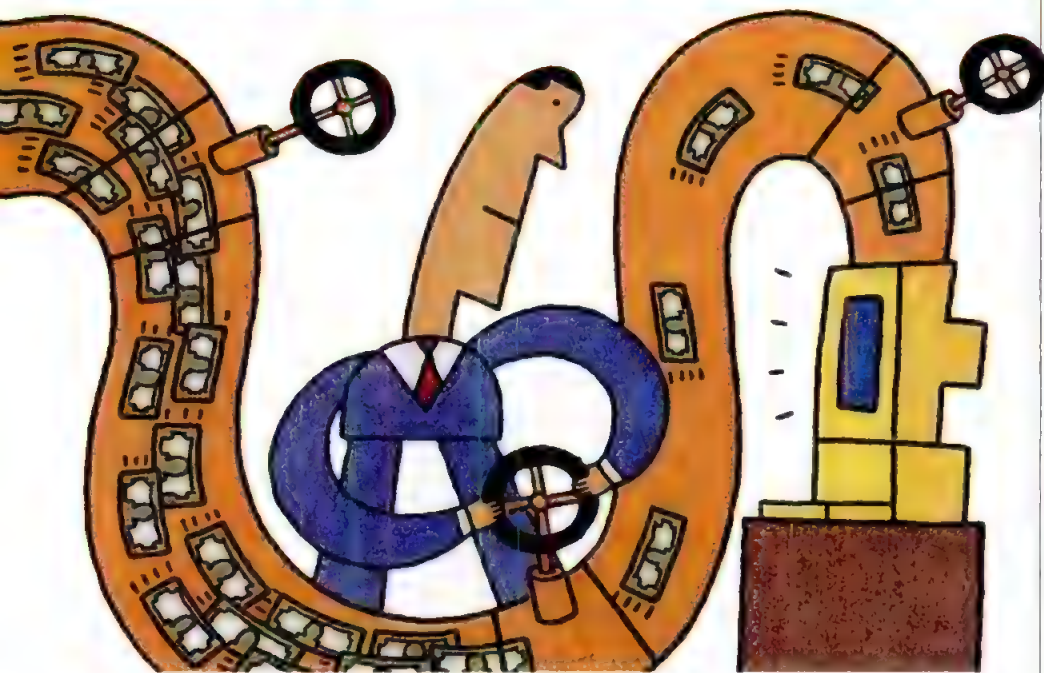
Phone: 886-3-577-0270 Fax: 886-3-577-5541 577-0267

CIRCLE 131 ON READER SERVICE CARD

Accton

Making Partnership Work

Net Tools



TKO Your TCO Today

Forget the thin-client hype. Today's desktop management solutions can slash the total cost of ownership of your existing PCs.

By Frank J. Derfler, Jr.

We typically think of PCs as great tools for keeping overhead costs low and productivity high, but in some camps PCs are being decried as a nightmare of upgrade and maintenance costs. Pundits speak of *total cost of ownership* (TCO) and *total value of ownership* (TVO) when they mean life-cycle cost and productivity.

The Gartner Group, a market research and consulting firm in Stamford, Connecticut, has estimated that an unmanaged PC running Windows 95 has an average annual cost of ownership of

\$9,784. The firm's estimate includes life-cycle capital costs of hardware and software, including upgrades; technical and administrative support costs; and the cost of users' time spent learning about, troubleshooting, and maintaining their PCs. A similar study from International Data Corp. comes up with figure of \$5,713. It adds time spent in application development but doesn't include user time.

Sensing the interest, fear, and uncertainty in corporate boardrooms over the costs and benefits of PCs, IBM, Oracle Corp., and Sun Microsys-

INSIDE

WELCOME to the debut of *PC Magazine's* new Net Tools section. We'll be appearing in every issue of *PC*



Magazine, doing what we do best—labs-based comparative reviews of network infrastructure products. Our From the Bench section will feature individual reviews of new networking products. And you can learn about Internet technologies in our Internet Tools column.

TCO MANAGEMENT Senior networking editor Frank Derfler, contributing editor Les Freed, contributor Eric Harper, and the staff of PC Labs test four management packages that can reduce the total cost of ownership of your desktop PCs by installing new software and even new operating systems remotely. *Page 223.*

VOICE OVER IP Contributing editor Les Freed tests two solutions from Micom Communications and Vienna Systems that let you bypass the telephone network by using your own IP network for voice communications. *Page 245.*

INTERNET TOOLS

Contributing editor Tony Pompili explains the technology and issues behind virtual private networking.



www.pcmag.com

NetTools Online
All files mentioned in this section are available for downloading from our Web site.

Net Tools

PC MANAGEMENT

tems have leveraged TCO as a way to pry open the iron grip of Microsoft and Intel on the desktop market via the much-hyped network computer. The new low-cost personal computing device relies almost totally on the network for its applications, which are intended to be mostly Java applets. Another group of vendors including Boundless Technologies, Citrix Systems, and Network Computing Devices has a similar concept in which bare-bones clients run traditional Windows applications remotely off a multiuser Windows NT server running Citrix's WinFrame, using local processing power merely to render graphics to the screen.

Finally, Intel and Microsoft have responded with their own low-TCO system—the NetPC—which isn't bare-bones at all, but limits user access to the hard disk and case—and the Windows-based terminal, which is similar in concept to the Citrix solution (in fact, Microsoft plans to license some of the technology in WinFrame).

Collectively labeled *thin clients*, these products are all aimed at transferring control of personal computers from the users to corporate

IS. (For more about thin clients, see the sidebar "Thinking Thin.") Presumably, both users and administrators would spend far less time troubleshooting the simpler clients than they would full-fledged PCs. Client hardware upgrades would also be less frequent, since most of the computing horsepower would come from the server and the network. And software upgrades would become much easier, since they would have to be done only on a few servers and not on multiple clients. Hence a lower TCO.

REDUCING TCO TODAY

You may want to establish a corporate test bed to evaluate network computers or NetPCs for certain applications in the future, but don't think the only way to lower the TCO of your PCs is by scrapping them for thin clients. Many of the cost-reducing components of the thin-client model can be applied to existing PCs, bringing cost of ownership down to levels that compete admirably with thin clients.

In this feature we examine four products that allow you to apply low-TCO techniques to some or all of the PCs in your inventory.

Desktop and network management suites such as Intel's LANdesk Management Suite, McAfee Associates' Saber LAN Workstation, Symantec Corp.'s Norton Administrator Suite, and Seagate Software's Desktop Management Suite have been around for several years, offering TCO-reducing features such as hardware and software inventory and software distribution. However, these packages assume that an operating system has already been installed on each client PC. For this roundup, we looked for a new class of desktop-management applications that allow administrators to distribute client operating systems to scores of client PCs that have not been previously connected to the network.

PC Magazine Labs became crowded when we brought in Intel's LANdesk Configuration Manager, KeyLabs' LabExpert, and ON Technology Corp.'s ON Command Comprehensive Client Manager. IBM has a similar product called LANClient Control Manager, but as it works only with certain IBM desktop machines, we don't review it here. It is quite powerful, however, and should be worthy of consideration as it matures. We also decided to take a look at the only shipping piece of Microsoft's Zero Administration Windows initiative (ZAW)—the Zero Administration Kit (ZAK)—along with the company's System Management Software (SMS). SMS can't configure a client PC with its initial operating system, but you can use it to upgrade Windows 95 clients to Windows NT. It also incorporates some of the features that will eventually be part of ZAW, which will be fully realized in Windows NT 5.0, shipping in early 1998. ZAW will feature the ability to reflect a PC's entire state to servers on the network, so that the client PC's hard disk acts merely as an intelligent caching device; automatic driver and software updates to clients over the network; and the ability to prevent users from installing new hardware or software or accessing system files on client PCs.

Note that Intel's LANdesk Configuration Manager is a separate product from the well-known LANdesk Management Suite, although it is part of the same family of products.

While each product set in this review is fairly unusual, these products primarily provide low long-term TCO by blasting OSs and software to desktop computers in much less time

EDITORS' CHOICE

• Waiting to mature



We came very close to awarding the Editors' Choice to ON Command Comprehensive Client Manager, but in the end we decided to give it an honorable mention

instead. CCM's ability to intervene in the client boot process, format the hard disk, and install the initial client operating system as if a user were responding to prompts is an impressive feat that we haven't seen before. It's also a great way of avoiding one of the biggest TCO drains for the administrator: walking around to configure and reconfigure PCs.

Unfortunately CCM was not quite there yet, even though what we looked at was basically the shipping product, according to the company. It didn't work with our Intel network adapter, and parts of the software were still in German. CCM's pricing also suggests it for organizations of 500 or more clients. If your organization fits ON's profile, however, you should definitely take a good look at CCM.

While Intel's LANdesk Configuration Manager makes the same claim as ON's product, we found it to be excessively buggy.

And the Intel product's typical installations can be run to configure only identical PCs.

We were also impressed with Microsoft SMS. Unfortunately, SMS didn't completely meet our filter. While it can do some operating-system upgrades, SMS cannot install an operating system to a system that doesn't already have one installed.

However, SMS is a very stable and useful product for cutting TCO. It can run software installation scripts for many popular programs remotely and upgrade users to new versions of Windows. SMS installed fairly easily and worked smoothly.

We also found ZAK, together with Windows NT's existing policy management capabilities, to be very useful for preventing users from tampering with their systems.

In the end, we thought these TCO management solutions show the state of the market: lots of good ideas and some good approaches, but few products that are mature and well supported.

than it would take an administrator to walk around and configure each client PC. ZAK adds *policy management* techniques to manage users' desktops and limit their access to their systems.

THE TCO PAYOFF

In testing each of these products, we came to the following conclusions.

Adopting policy management software, such as ZAK, is the smartest thing you can do in the long term to achieve low TCO. The Gartner Group refers to "user-proof" technology, such as policy management software, as a "powerful enabler" of low TCO. Microsoft is more specific in identifying five common user actions that drive up support costs. Policy management software can eliminate these user gaffes:

- unintentionally deleting necessary system files from a hard disk;
- modifying the control panel or registry incorrectly;
- introducing incompatibilities or viruses by installing new software;
- "futzin' around" with system settings such as colors, backgrounds, and desktop arrangement;
- installing and using unapproved, job-unrelated software like games. Policy management eliminates much of the disruption of

emergency calls to the IS staff and enhances user productivity.

If you have more than a dozen client PCs, the ability to upgrade client software centrally is the second most important step you can take to lower your TCO. A central upgrade capability can eliminate time-consuming and awkward visits to each desktop and provide other benefits, such as reducing the need for training and eliminating file incompatibilities.

Our PC Labs staff examined what it took to install Windows 95 and Microsoft Office 97 using the upgrade capabilities of LabExpert, LANdesk Configuration Manager, ON Command Comprehensive Client Manager, and SMS. All of the products except SMS are fairly new, and all have a few bugs to be overcome. But we were particularly impressed with ON Command and SMS, both of which actually run through program and OS installation scripts automatically. This is a much more sophisticated and useful method for software distribution than the snapshot method used by traditional software distribution packages and by LanDesk Configuration Manager, which assume that all your clients are identically configured. ON Command even lets you back up user files and machine-specific data (Registry entries, driver files, and so on) and then restore those files after an op-

erating system installation. Despite the fact that it's a shipping product, we found LAN-Desk Configuration Manager to be too buggy for prime time. And LabExpert, although impressive, is primarily suited for a testing laboratory environment.

THIN CLIENTS, THIN OFFERINGS

We also look at some of the initial thin client offerings in a sidebar ("Thinking Thin"). What we found is that thin client products exist today primarily in press releases. Getting our hands on a Sun/Oracle-style network computer proved to be an impossible task, as we couldn't find a single vendor that thought the technology was ready for prime time, much less review. We did manage to look at one of the first NetPCs, but the principle server software, based on ZAW, that will ultimately work with a NetPC is not yet ready and won't be until Windows NT 5.0 ships next year. Only the WinFrame-style Windows terminals are fully functional today. For a review of the Compaq Deskpro 4000N NetPC, see "Mini, Manageable Desktop" in this issue's First Looks section.

Will these devices replace the PC that exists today? From our preliminary hands-on evaluation and from talks with the vendors of these products, our answer is an emphatic no. Any TCO evaluation that directly com-

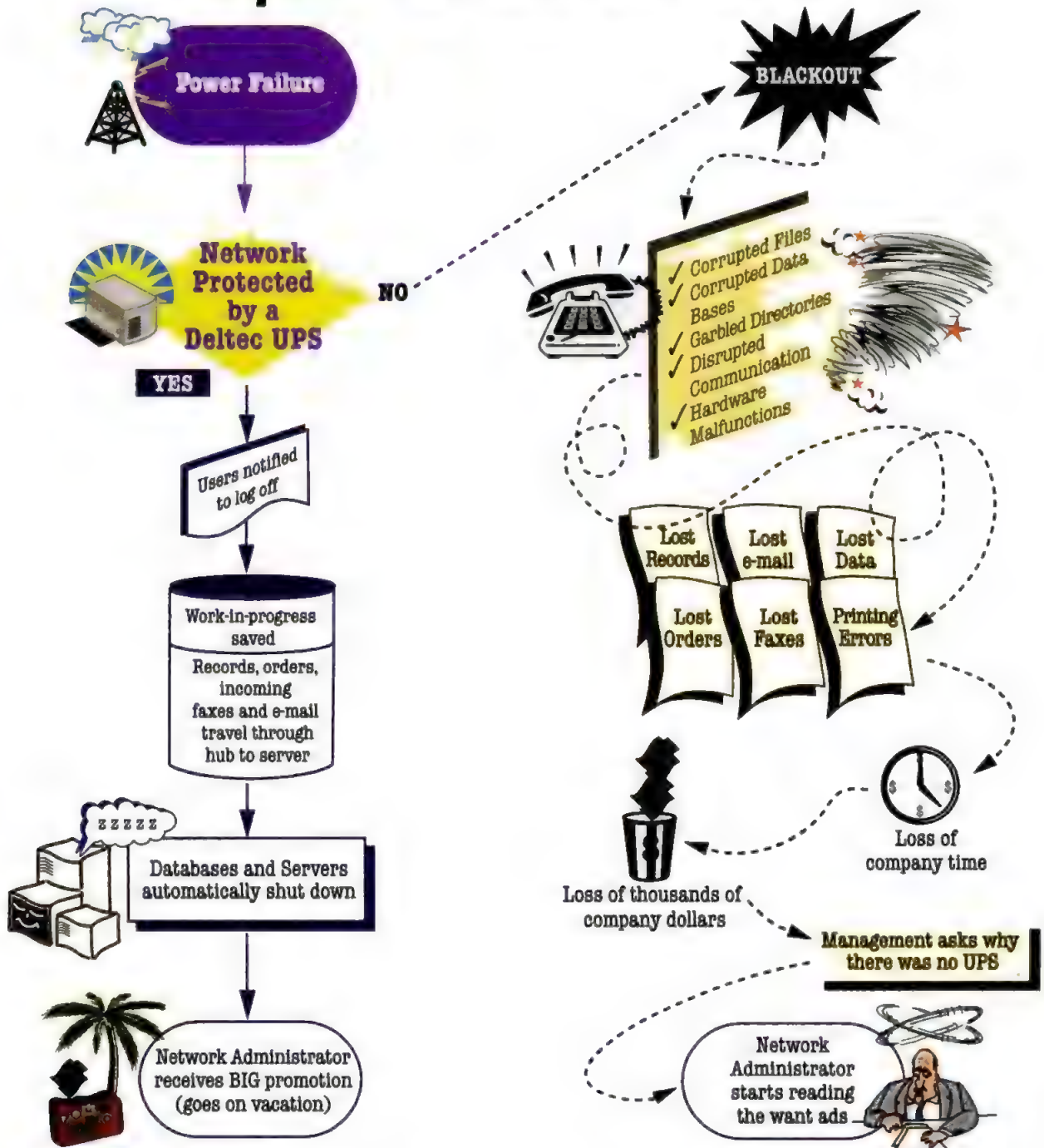
TCO Solutions Compared

Each solution takes its own approach to lowering TCO, with its own savings potential and implications for users.

	Product vendors	Best use	Estimated savings	Added costs	User implications
Managed PCs Standard PCs with enhanced management features in firmware and software.	Compaq, Hewlett-Packard, IBM, many other PC vendors will follow. Intel, Keylabs, Microsoft, ON Technology, and others for management software.	Larger networks of users needing maximum performance and Windows-based applications.	About \$500 per client annually in support costs over non-managed PCs. Gains come from user proofing and centralized software delivery.	About \$3,000 to \$5,000 per 50 clients for management software. May require purchase of new LAN adapters, \$50 per client.	Users must accept policy management limitations on programs and actions. In return, they get excellent performance and familiar applications.
NetPCs Buttoned-up PC hardware with no floppy disk drives. Also known as LANstations.	Compaq, Hewlett-Packard, NEC, and others. AST, Dell, and others offered similar hardware a decade ago.	Running standard or custom applications with high security. Useful in public buildings, government agencies, financial service organizations, sales kiosks, and schools.	Difficult to quantify. Little or no initial cost savings over PCs. The annual support savings could be tremendous, depending on the use and abuse the systems receive.	Require a network and some server programming. Systems with internal hard disks need very little support after applications are loaded.	Users will have little control over their systems and software. Great for single-task applications in a public environment.
Network computers Devices using fast processors executing a Java environment. Essentially an Netscape HTTP, HTML, and Java terminal working with a Web server and server-based Java apps.	Digital, IBM, Sun, Tektronix and others for hardware. Oracle, Symantec, and others for suites of common office applications. Many specialized applications are anticipated.	A replacement for data entry terminals or an IP interface for televisions, vending machines, and other devices.	Initially, about \$500 to \$1,000 less than PCs. About \$500 per client annual savings in support costs over nonmanaged PCs. But many planned applications are for unique or customized tasks.	\$5,000 to \$10,000 per 50 clients for server and network hardware. Unknown costs for applications development.	NCs are not direct replacements for PCs. They challenge traditional terminals and have unique applications as network appliances.
Windows terminals Devices with minimal processing power and few user options that run familiar applications on a shared central processor.	Boundless Technologies, Citrix, Microsoft, NCD, and Wyse.	Users who don't need maximum computing power or flexibility but want familiar applications. Particularly useful for sharing database applications.	Initially, costs run \$1,000 to \$2,000 lower than for PCs, with savings of \$500 to \$1,000 per client annually in support costs over nonmanaged PCs. Long-term gains come from user-proofing and centralized software management.	\$15,000 to \$25,000 per 50 clients for ICA server (hardware and software) and network; will cost less when Windows NT 5.0 is released.	Slow performance when many clients are using the shared server at once. Users can log on from anywhere and access files. Users have no freedom to try new software or tinker with the system. If the network goes down, client systems can't be used.

What a difference a UPS makes...

Improve the flow with Deltec.



CALL NOW
1-800-DELTEC-1

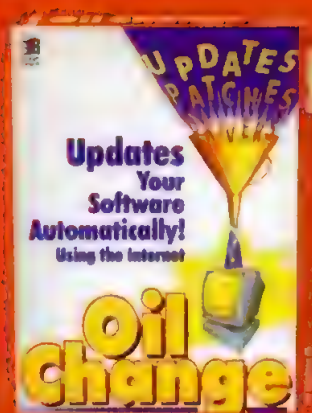
Win prizes at our Web site
<http://www.deltecpower.com>
or e-mail: info@deltecpower.com

DELTEC



For the easiest
way to automatically
update your PC,
click this button!

Start



Just click the Oil Change™ **Start** button and you've found the easiest way to update your software and hardware **automatically**. Oil Change locates new software updates and hardware drivers for your PC via the Internet. Simply select the updates you want and Oil Change will download and install them **automatically**. *It's that easy.* Oil Change finds everything from the latest software updates to the newest hardware drivers; it even updates over 400 computer games.

So, why waste time trying to find, download and install updates yourself? Get Oil Change. It's the **easiest** way to update your PC.

Pick up a copy today at your local retailer, or call 1.800.841.3539 x19 to order direct.
To download a free trial copy, visit our website at www.cybermedia.com/pc1

CIRCLE 294 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink


CYBERMEDIA
MORE POWER TO YOU™

compares thin-client solutions to typical desktop PCs is answering the wrong question. Will thin clients make their way into certain areas of certain types of corporations? We think yes, but principally as a replacement for the present 30 to 50 million text-based dumb terminals. Other environments where you may find Windows-based terminals will be those in which users require PCs for limited tasks, such as order entry, or where they work with a limited set of programs doing repetitive tasks. Government agencies, public buildings, financial-service organizations, and

other environments where security is important will also find the inherent security of a user-inaccessible device such as the NetPC attractive.

Few corporations using lots of mainstream Windows applications today will find it worth the time and expense that will be required to scrap those applications and systems for Java applets. Nor will they find the power, performance, and features of today's Windows business applications in Java appli-

Net Tools

PC MANAGEMENT

cations and the JavaOS for a long time to come. And our experience with Windows terminals indicates that scalability and perfor-

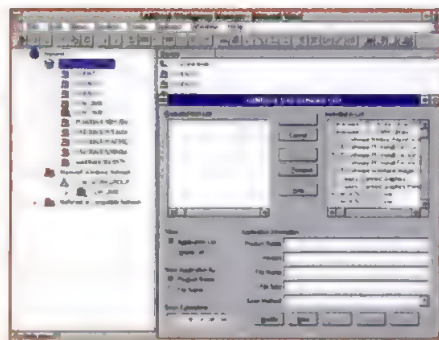
mance may be a problem if you're seeking to support large numbers of today's mainstream PC users on the network.

So if you're looking for ways to lower TCO today, your best bet is to take a look at some of TCO-lowering software we review here.

Intel Corp.

LANDesk Configuration Manager

If you need to install Windows operating systems on lots of brand-new client PCs or upgrade existing machines to new Windows versions, Intel Corp.'s LANDesk Configuration Manager (\$9,995 list) can handle the task fairly well. Unfortunately, we found a number of disadvantages to this product when compared with ON Command Comprehensive Client Manager and Microsoft Systems Management Server 1.2. The version of LCM that we tested had a fair number of bugs, which made installation a long and difficult process. While ON Command's scripts can adjust software installations to varying



EASY CLIENT INSTALLS To install client software with LANDesk, simply select your clients and choose your software from a list (at right).

client configurations, LCM assumes a typical installation each time. Some client-side intervention is required to initiate software installations, and the product gives you fully automated functionality only if all your clients have Intel NICs installed. Finally, aside from operating systems, software application installations are done via a method that assumes all your client configurations match the one used to create the snapshot.

Definitely a version 1.0 product, LCM gave us some real problems during its installation, though we eventually did get this hardware/software combination working. The LCM box houses a 166-MHz Pentium processor with a 2GB hard disk, 64MB of

SUMMARY OF FEATURES

Desktop Management Solutions

■ YES ■ NO	LANDesk Configuration Manager	LabExpert 2.0.2	ON Command Comprehensive Client Manager	Microsoft Systems Management Server 1.2
Products listed in reviewer order				
List price for 100 clients/500 clients	\$9,995 / \$9,995	\$6,000 / \$20,000	\$25,000 / \$27,500	\$4,692* / \$20,975*
Formats/partitions the hard disk	■ ■	■ ■	■ ■	■ ■
Works with/doesn't require boot PROM on NIC	■ ■	■ ■	■ ■	■ ■
Intervenes				
In boot from boot PROM	■	■	■	■
In boot from floppy disk	■	■	■	■
Before operating system boots	■	■	■	■
Works with Wake on LAN adapters	■	■	■	■
Compatible Operating Systems				
Server runs on				
Windows NT Server 3.51/4.0	■ ■	■ ■	■ ■	■ ■
NetWare 3.11/IntranetWare	■ ■	■ ■	■ ■	■ ■
OS/2 Warp Server / Sun Solaris	■ ■	■ ■	■ ■	■ ■
Console runs on				
Windows 3.x/Windows 95	■ ■	■ ■	■ ■	■ ■
Windows NT Server 3.51/4.0	■ ■	■ ■	■ ■	■ ■
Windows NT Workstation 3.51/4.0	■ ■	■ ■	■ ■	■ ■
OS/2 Warp Server / Sun Solaris	■ ■	■ ■	■ ■	■ ■
Product manages				
Windows 3.x/Windows 95	■ ■	■ ■	■ ■	■ ■
Windows NT Workstation 3.51/4.0	■ ■	■ ■	■ ■	■ ■
DOS / OS/2 Warp	■ ■	■ ■	■ ■	■ ■
Macintosh	■ ■	■ ■	■ ■	■ ■
Client Operating-System Installation				
Installs Windows 3.x/Windows 95	■ ■	■ ■	■ ■	■ ■
Installs Windows NT Workstation 3.51/4.0	■ ■	■ ■	■ ■	■ ■
Installs DOS / OS/2 Warp	■ ■	■ ■	■ ■	■ ■
Installs Macintosh	■ ■	■ ■	■ ■	■ ■
Runs full installation scripts/Copies bits	■ ■	■ ■	■ ■	■ ■
Does not need user intervention to install OS	■ ■	■ ■	■ ■	■ ■
Software installation				
Installs application software	■ ■	■ ■	■ ■	■ ■
Runs full installation scripts	■ ■	■ ■	■ ■	■ ■
Can add software to existing system	■ ■	■ ■	■ ■	■ ■
Installs applications after an OS is installed	■ ■	■ ■	■ ■	■ ■
Uninstalls applications	■ ■	■ ■	■ ■	■ ■
Backs up and restores user files/registry entries/driver files	■ ■	■ ■	■ ■	■ ■
Can run without IP/DHCP	■ ■	■ ■	■ ■	■ ■

* Requires SQL Server (not included) running on Windows NT

solutions@work

- High Speed Communications
- CAPI 2.0 Support
- Share ISDN Lines
- Network your DIVA ISDN Devices
- Connect Host or Remote desktops



High Speed ISDN Data Communications

Achieve high speed ISDN data communications across your network. LANSource, Symantec and Eicon have partnered together to bring you the most powerful data solution available in today's Remote Access market.

By combining the three products on a your corporate LAN, you enable any workstation to be a pcANYWHERE "Host" or "Remote". No longer does every workstation need to be equipped with ISDN hardware or ISDN lines.

Here's How it Works - Since pcANYWHERE, DIVA and WINport all support the ISDN CAPI 2.0 standard, the devices and lines are all grouped at the LANSource Communications Server. Continue using pcANYWHERE as usual, the only change that you will notice is the **BLAZING SPEED**. Install all three and see how File Transfer, Remote Control and Remote Node sessions will appear as if you are physically connected. For more information contact us by email, fax, phone or browse any one of the web sites listed below.



EICON
TECHNOLOGY

WINport

pcANYWHERE 32

CIRCLE 075 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

LANSource Technologies

Tel: +1 (416) 535-3555 Fax: +1 (416) 535-6225

enquiries: solutionsatwork@lansource.com

www.lansource.com, www.eicon.com, www.symantec.com

Automatic Email Retrieval and Delivery!

EZMail™ delivers your email to you wherever you are! This amazing new product automatically notifies you of new email by an on-board flashing yellow LED or by your pager. User defined filtering ensures only important email is delivered to you via your printer, fax machine, or alpha-numeric pager. **EZMail™** supports four dial-up email accounts simultaneously and checks for new email at intervals that you define. Best of all, after initial set-up **EZMail™** does not require a dedicated PC to operate. Now you can take your notebook PC on the road with you and still receive critical email wherever you go!

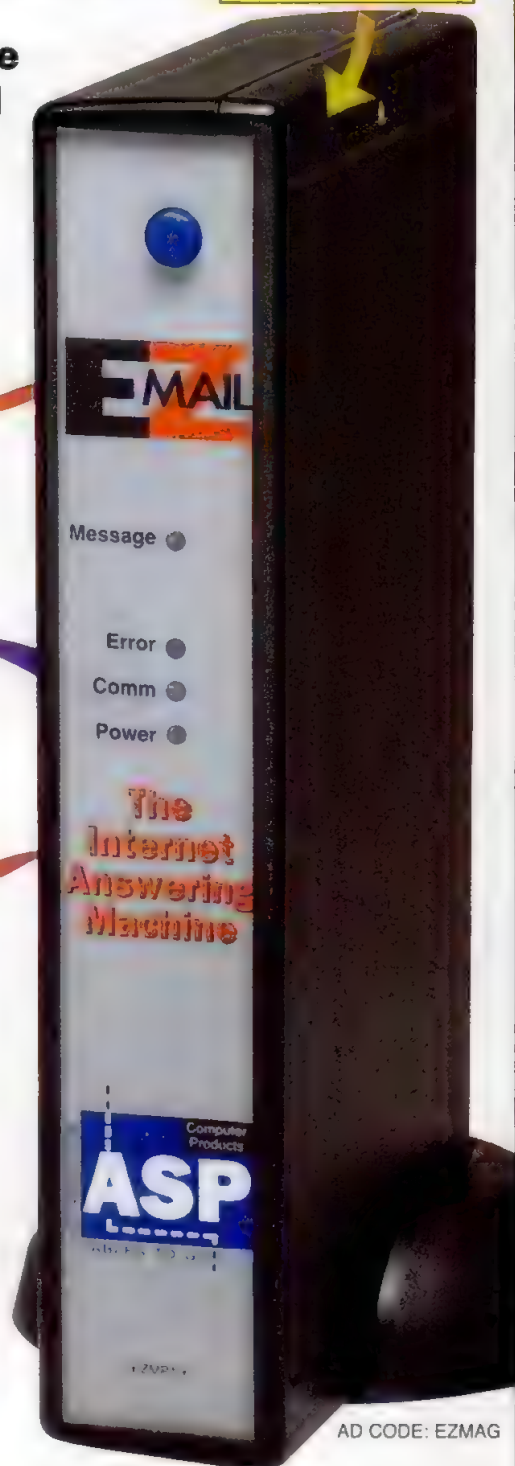
**Retrieve
Your Email
Without A PC!**

EZMail™ Dials Up Your Internet Service Provider (ISP), Retrieves, Filters and Delivers Your Email To You By...



Features & Benefits:

- Ideal business tool for small offices or home, offering users a more productive way to use email on the Internet.
- Internet users can easily and instantly get email messages for up to four accounts without a PC after initial set-up.
- Automatic retrieval and notification of new email messages eliminates the tedious task or manual log-in to the Internet.
- Retrieves email messages from multiple Internet Service Providers.
- Robust filtering options let you filter email for important messages or screen your email for only the email that you want.
- Delivers email messages directly to your printer, local fax machine, remote fax machine or alpha-numeric pager.
- Redirect email from anywhere to anywhere with a control email message.
- Easy set-up with **EZMail's™** intuitive installation wizard with Windows 95, Windows 3.x, and Windows for Workgroups.



AD CODE: EZMAG



1914 Junction Avenue
San Jose, CA 95131
www.asp.net
aspsales@asp.net

©1997 ASP Computer Products. All Rights Reserved.

**Ordering
Information:**
1-800-506-9604

Hassle-Free® Connectivity!

**The odds of your business succeeding
are now stacked in your favor.**



Introducing
NETCENTER™

- ✦ Easy-to-use information & resources
- ✦ Simple installation & maintenance
- ✦ Stackable compact desktop design
- ✦ Lifetime warranty & free support

If you're running a small business, you've got your work cut out for you. You know that, of course. But what you may not know, yet, is how much you could use NetCenter, the new family of networking products that bring big business performance to small businesses, with a daring twist: simplicity.

That's right, simple networking. Because NetCenter products won't force you to enroll in engineering courses, yet they pack all the punch of costly corporate systems. Which means you can share files, printers, and Internet connections between your PCs, saving time and money.

NetCenter is a whole new concept in networking, designed specifically for small business, and dedicated to helping you beat the odds. To find out how we stack up, call 1-800-531-0600 for a free copy of our Basic Networking Tutorial, or visit www.netcenter.dayna.com.



CIRCLE 215 ON READER SERVICE CARD

Simple networking solutions.

www.netcenter.dayna.com

© 1997 Dayna Communications, Inc. NetCenter is a trademark of Dayna Communications, Inc.

RAM, and an Intel EtherExpress PRO 100/B NIC. The only hardware you may need to set up is the LANdesk Service Agent flash chip. You install the chip on your clients' Intel EtherExpress adapters, so they can communicate with the LCM. If you don't have these chips or EtherExpress adapters, you'll need to create boot floppy disks for the clients on your network. The LCM System Setup pro-

gram helps you create these disks, but installing them will require some walking-around time. As for connecting clients to the system, LCM uses DHCP. If you don't have a DHCP server on your network, you can download a patch from Intel's Web site that will let you use LCM without a DHCP server.

Net Tools

PC MANAGEMENT

LCM comes with Windows NT Server 3.51 preinstalled as the application platform; the software will not work with Windows

NT 4.0. The console software you use to build distributed services can be installed either on the LCM system or on another Windows NT 3.51 system.

PCALTERNATIVES

Thinking Thin

In our main roundup, we review tools for reducing the total cost of ownership of traditional PCs. If you've been following the TCO debate at all, however, you probably know that there are some new designs for network-centric desktop computers, also known as thin clients, that are geared toward a lower TCO than a traditional PC. In this sidebar we look at the Big Three thin-client designs: the network computer, the NetPC, and the Windows terminal.

We brought sample NetPC and Windows terminal products into PC Labs for some testing. We weren't able to obtain an Oracle/Sun-style network computer, but we did get an extensive demonstration of the Sun JavaStation. Each design takes a different approach to the TCO problem, but they all claim to lower TCO with equipment that is easier to install, manage, and maintain than the PCs we currently know and love—or sometimes hate. What we found, however, is that neither the NetPC nor the Windows terminal nor the network computer is a viable replacement for the PC. For now, these products are targeting very specific markets. For a quick overview of the costs and benefits of thin clients and managed PCs, see "TCO Solutions Compared" on page 225.

NETWORK COMPUTERS

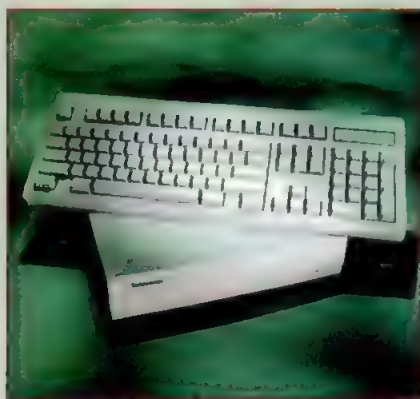
The most radical departure from the PC world is the network computer, the PR love child of Oracle Corp. and Sun Microsystems. True network computers must comply with the Network Computer Reference Profile, which Oracle has established through its subsidiary, Network Computer Inc. In fact, this past spring, the Open Group, along with Apple Computer, IBM, Netscape Communications Corp., Oracle, and Sun, announced an initiative to develop a network computer logo, based

on what the group calls rigorous testing, so that the confusion over what is and what isn't a network computer is eliminated.

The Hardware Reference Design requires 4MB to 64MB of RAM, an 8MB ROM card, a SmartCard slot, infrared and network interfaces, a parallel port, and a pair of PS/2-compatible I/O ports for connecting a mouse and keyboard.

Officials at Sun say they have had the JavaStation in use with several customers and have been fixing bugs and addressing larger issues, such as how to get the JavaStation to boot directly from servers besides those from Sun. By end of the third quarter, Sun plans to ship a new and updated product that the company currently refers to as the Mission Critical JavaStation.

The JavaStation we saw (\$742 list, Sun Microsystems Inc., 650-960-1300, www.sun.com) houses a 100-MHz microSPARC II processor that boots over the network either from a server or from optional flash memory. It runs the JavaOS system software,



EASY HOOKUP Installing and connecting Tektronix's NC215 Business Network Computer to the network took all of 20 seconds.

which consists of a small Java kernel with an embedded Java Virtual Machine (JVM).

Like the Windows terminals, the JavaStation is essentially a server-centric solution, though the server sends Java applets over the network to reside in the network computer's RAM. The JavaStation ships with its own graphical desktop. Hot

JavaViews, which includes e-mail and scheduling applications as well as Sun's HotJava browser. In addition, JavaStation comes with Insignia Solutions' Ntrigue, for running Windows applications remotely off an applications server, and with a terminal emulation package written in Java from OpenConnect Systems.

For now, Sun is going after the dumb terminal market, though the goal is to replace traditional green screens with graphical Java-based interfaces to legacy data. Sun is targeting government, large call centers, and customer-service operations.

NETPCS

The NetPC is an initiative launched by the formidable Intel/Microsoft alliance. We looked at NetPCs from Compaq—the Deskpro 4000N (price unavailable at press time, Compaq Computer Corp., 800-345-1518, www.compaq.com)—and NEC—the PowerMate (\$1,299 list, NEC Computer Systems Division, 888-863-2669, www.nec-computers.com). Both machines have a small footprint, a Pentium processor, 32MB of RAM, and an internal hard disk running Windows NT Workstation 4.0. And both have management agents facilitating remote-administration tasks.

Architecturally, NetPCs are strikingly similar to PCs. The biggest differences are that a NetPC doesn't have a floppy disk or CD-ROM drive, and that the hard disk is meant to be used merely as a local cache, with all of the user's files and applications residing on the network. (We were able, however, to store data locally in our tests.) And in the systems we looked at, only one PCI expansion slot was available—but not a single ISA slot. All management and configuration of NetPCs is done centrally at the server, and users are completely locked out of their systems. In addition to Microsoft and Intel, Acer America Corp., Compaq, Dell Computer Corp., Gateway 2000, Hewlett-Packard Co., and IBM are also clamoring to enter this market with recent product announcements.

Continues



HP AdvanceStack Switch 2000

*The only switch in its class to have
Layer 3 Switching Software standard*

Connectivity options: 10Base-T, 10Base-FL, 100Base-T, 100VG and FDDI

IP Multicast (IGMP) Support

Layer 3 Protocol Filtering

Multiswitch Port Trunking

HP Network Performance Advisor for automatic
LAN troubleshooting

And a three-year on-site warranty

**If your networks aren't speaking to each other,
allow us to provide a counselor.**

To learn more about HP switches, visit: www.hpresource.com/2000

Net Tools

PC MANAGEMENT

Once the console software is up and running, you can start creating a service boot menu. Service Boot Manager is the LCM Console application that guides you through creating LCM's services, which are a series of standardized desktop configuration scripts. A Service Wizard makes the process pretty straightforward. For our tests, we created a service that ran FDISK, formatted

the hard disk, and installed Windows 95 on 12 identical machines. Once we booted the clients and selected that service from the menu, the process performed all these tasks completely unattended. But remember that you do need someone at the client machine to select the proper configuration script from

the service boot menu and launch the process, though this is easy enough that any user could do it.

To upgrade software with LCM, you must create application packages using the included Package Builder utility. Package Builder takes a snapshot of a desktop system's current configuration—including

Continues

An important piece of the NetPC puzzle is Microsoft's Zero Administration Windows (ZAW), which wasn't fully available in time for this feature. We look at the first piece of ZAW, the Zero Administration Kit (ZAK), in a review in this feature. The complete ZAW will be built into new versions of Windows NT, Windows 95, and Windows NT Workstation. According to Microsoft, ZAW will provide the means to reflect a user's files and applications on the network while using the NetPC's hard disk as a cache for high performance. It will also handle system updates and application installations automatically, centralize administration, and lock down users' systems.

With ZAK, SMS, and the policy managers in Windows 95 and Windows NT, you can already accomplish some ZAW-like functions, such as centralizing administration and restricting configuration, without investing in NetPCs. But Microsoft claims that the NetPC will eliminate problems caused by users tampering with their desktop systems. Since the hard disk is simply caching data stored on the LAN, a single NetPC can be shared by several different users. And you can ease security concerns by leaving out the floppy disk drive. The Compaq Deskpro 4000N we looked at had Compaq management software built in for configuration, asset, fault, and security management. The machine also featured remote boot and Wake On LAN support.

The NEC system we tested came pre-configured with software from Intel. LANDesk management agents for inventory, remote control, and software distribution were part of the package.

WINDOWS TERMINALS

Of all the PC alternatives, Windows terminals may be the most like dumb terminals. In a Windows terminal environment, as in a dumb terminal environment, processing is handled by a centrally managed system instead of having each machine process its own request. Nothing is stored locally. Windows terminals are being marketed

primarily as replacements for dumb terminals. You can use Windows terminals to run Windows applications if you connect your machines to a Windows NT server running Citrix Systems' WinFrame.

Theoretically, the Windows terminal approach could accomplish a great deal in



MANAGEMENT CENTRAL NEC's PowerMate NetPC came with Intel LANDesk agents for software inventory and distribution.

reducing TCO because the client machines are stateless—all data, applications, and configuration information reside on the central server. If a client crashes, simply take a new box to the user's desk, plug it in, and go. But if the server goes down, so do all your clients. You should realize that you will typically have to boost your server's performance substantially to accommodate the processing requirements of several users.

Although Microsoft has announced plans to build multiuser capabilities into Windows NT 5.0, the only way to accomplish that now is through WinFrame, which gives users the ability to run Windows applications from a network server.

WinFrame is an extension that makes Windows NT a true multiuser system similar to Unix. When users log on to a WinFrame server, they see a log-on screen as if they were sitting at an NT 3.51 system, but in reality they're remotely controlling a Windows NT session running on the server.

To try the Windows terminal experience, we looked at the Explora Pro from Network

Computing Devices (\$850 list, 888-446-3896, www.ncd.com), and the NC215 Business Network Computer from Tektronix (\$1,495 list, 800-547-8949, www.tek.com); Boundless Technologies and Wyse Technology play in this space as well (details can be found in "NCs: Fact or Fiction," *PC Magazine*, March 4, 1997). The Explora Pro comes with WinCenter, a complete Windows terminal package that includes WinFrame as well as configuration utilities for the company's line of clients. The Tektronix solution, in contrast, presumes you have Windows NT server already installed and simply provides utilities to boot the clients.

When we tested the Explora Pro and the NC215, hooking the clients up to the network took only about 20 seconds. Both machines have PS/2 sockets for keyboard and mouse, a VGA port, and serial and parallel ports. The Tektronix system also has plugs for speakers and a microphone.

As easy as these clients were to connect, we found that configuring the server software requires a major investment of time. There's lots to configure—boot configurations, application support, and so on—and we found the documentation lacking. Setting up remotely booted systems is particularly tricky. If you're new to it, be prepared to spend some time with research and in trial and error. The systems we looked at give a choice of bootp, tftp, DHCP, or rarp.

Both the NCD and Tektronix systems we looked at work in non-Windows environments. They can be used for Java applications, mainframe terminals, or a number of other possibilities, though we looked at them only as Windows terminals.

WHAT TO DO

It's not time to replace your desktop machines with JavaStations. However, you may find that a mix of several different systems for different users and functions in your organization makes sense. You have to take a hard look at your current business processes. We strongly suggest you get some systems to test in your environment.—Eric Harper

TCO Cutters



PC Magazine Labs put these cost-reducing products to the test using 12 Dell Dimension XPS P133c machines as clients. To test the ON Command Comprehensive Client

Manager, we set up our client configurations using a Sun Ultra-Enterprise II server (which had two 300-MHz SPARC processors, 256MB of RAM, and ran Solaris 2.5.1) as the software depot, a Z-Server (which had a Pentium/100, 32MB of RAM, and ran Windows NT Server 4.0) as the administration station, and a Dell OptiPlex GXpro (which had a Pentium Pro/200, 64MB of RAM, and ran Windows NT Server 4.0) as the deposit server.

To test Intel's LANdesk Configuration Manager, we used the Intel-supplied LANdesk Configuration Manager box, which had a PentiumPro/166, 64MB of RAM, and ran Windows NT Server 3.51.

To test KeyLabs' LabExpert and Microsoft Systems Management Server, we used a Compaq Proliant 5000, which had two Pentium Pro/200 processors, 128 MB of RAM, and ran Windows NT Server 4.0.

We completed two separate tests of each product: One had no other traffic on the network; the other did have traffic on the network.

For the products that could format a hard disk and install operating systems, we chose Windows 95 as the OS to install. As directed by the manufacturer, we initiated an installation of the operating system either by rebooting the machines (in the case of a Network Interface Card with a Boot PROM chip) or by initiating the download from the client via a menu. We then timed the installation process—including partition formatting—from the time the first client started the process until the last client finished.

We then moved on to the application installation portion of our testing. We chose one large application suite and one smaller update as our test suite. For our larger application, we used Microsoft Office 95; for our smaller update, we used Microsoft Service Pack 1 for Windows 95. We initiated a download of each of these packages and timed the installation as described above. Results of these tests are discussed in the reviews where relevant.—*Analysis written by Robert Norton*

files, file versions, and Registry entries. When you install the application, choosing setup options to suit your needs, Package Builder takes another snapshot of the system. The utility then marks the differences between the two snapshots and creates an executable.

To use this executable on another client machine, you must configure the second client identically to the original machine, which is an obvious drawback. Though this approach may be possible in some network settings, it's probably too limiting for most. As for our testing experience, even though we used identical systems in our test bed, we ran into major difficulties getting this feature to work. Luckily, if something goes wrong with your software upgrade, you can run another executable that removes the package.

All in all, LCM was the most problematic of the TCO packages we tested.—*Eric Harper*
LANdesk Configuration Manager. List price: \$9,995. Intel Corp., Santa Clara, CA; 800-628-8686, 408-765-8080; www.intel.com. Circle 955 on reader service card.

KeyLabs Inc.

LabExpert

Every toolbox needs a hammer, and KeyLabs' LabExpert 2.02 (10 clients, \$750 list) is the hammer in our TCO toolkit. While the rest of the products in this roundup allow you to install applications on network clients remotely in incremental fashion, LabExpert formats the client's hard disk and blasts it with an operating system all at once using a stored hard disk image. This all-or-nothing approach is best suited for environments with rapid user turnover, such as corporate training labs, classroom computer labs, or even testing labs like our own PC Labs.

LabExpert maintains a library of user-created compressed disk images on a server for installation on large numbers of client computers. A disk image contains the entire contents of a system's hard disk, including the operating system, application software, and any data files you want to install to the client systems.

To build a disk image, you install the desired operating system, applications, and data on an example computer and save that

Net Tools

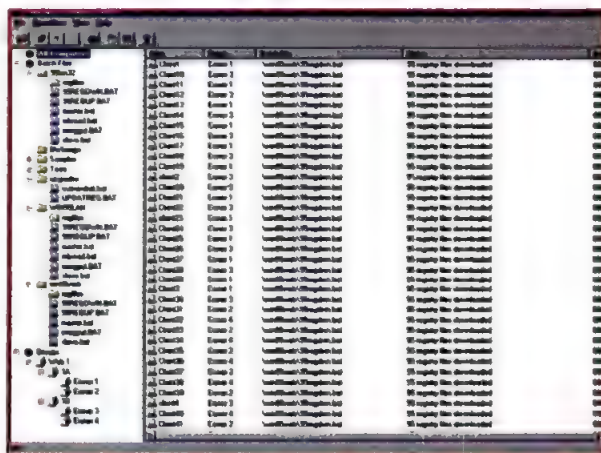
PC MANAGEMENT

image into LabExpert's library of disk images. LabExpert operates with virtually any client file system, including the FAT, NTFS, and NetWare file systems. It took us about 2 hours to install LabExpert and build an example client image.

To prepare your clients for use with LabExpert, you install a program called BootWorks locally on the individual clients. BootWorks can be loaded either on the system's hard disk or from a boot disk. BootWorks creates a special partition on the client's hard disk that contains a bare-bones copy of Caldera Open DOS and real-mode drivers for the LAN card.

When the client computer starts up, it boots Open DOS, loads the LAN drivers from the BootWorks partition, and establishes a connection with the LabExpert server. The LabExpert server then tells BootWorks whether there is a new image waiting for that system. If there is no new image, BootWorks loads the target OS from the main partition on the client system's hard drive, and the system boots like a normal PC. The entire process takes less than 30 seconds on a Pentium-based PC.

If a new image file is waiting for a particular client, LabExpert tells BootWorks to format the main partition on the hard disk and install a new boot image from the server. The client then reboots, this time loading the freshly installed OS from the hard disk. LabExpert is fast; it took only 5 minutes to install Windows 95 on our test machines. LabExpert also saves Registry information for Windows



HANDY IN THE LAB LabExpert provides a Windows Explorer-like interface for blasting disk images to hundreds of clients.

95 clients and restores Registry data once the operating system has been reinstalled.

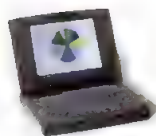
LabExpert's only shortcoming is its inability to layer new software on top of an existing

Carbon Copy

lets your users access their office PCs
no matter where they are.



And we do mean no matter where.



Being out of the office doesn't have to mean being out of touch – not with Carbon Copy. As thousands of IS professionals know, Microcom's award-winning software lets your users access and control their office PCs, transfer files from one PC to another, even access their office network whether they're at home or on the road. With Microcom's revolutionary new Pocket Carbon Copy, they can use a hand-held PC to control another PC thousands of miles away. The Carbon Copy product family supports all Microsoft operating systems: Windows 95, NT, CE, 3.x and DOS. Why not download a free trial version at www.microcom.com/55 or call (800) 283-4750, Dept. 55 for more information. Carbon Copy – because work isn't somewhere your users go, it's something they do.

microcom
All the Right Connections™



 **Seagate Software**

how am i ever
gonna get **Office'97**
to **3,000** users



before it's 1998?

Seagate WinINSTALL™ makes distributing and installing software effortless: its "Discover Wizard" steps you through the process

automatically, eliminating the need to write scripts. **do i dare let users pull down**

software? why can't i push it to them?? WinINSTALL lets you choose

the best way to distribute software from seven different delivery mechanisms, including push, pull, e-mail attachments, a scheduler,

and a new intranet web installer. **what if i want to customize the install? do i have to**

script the whole thing myself? Customization is easy, thanks to a unique fill-in-the-blanks

approach that lets you modify every single detail of an installation. What can be automated, should. Whatever saves you time - and money -

is cool. This is what Seagate Software's new era of information availability, access, and analysis is about.



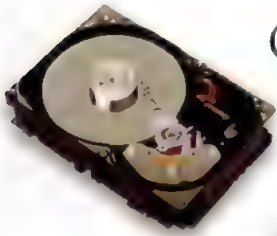
you gotta know™

For a free evaluation, 1-800-729-7894 or www.seagatesoftware.com

©1997 Seagate Software, Inc. Seagate Software and the Seagate logo are trademarks of Seagate Technology. Outside of the US and Canada call 1-407-531-7501.

CIRCLE 374 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

Save the Network.



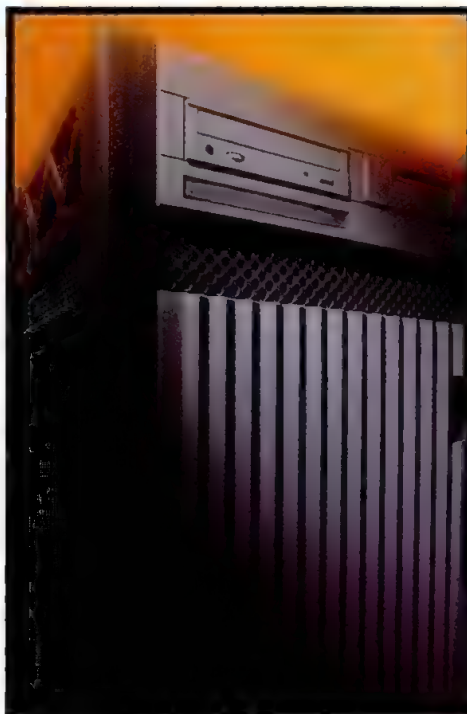
Cheetah, the world's highest performance disc drives, for the world's highest performance servers.

When your application calls for the absolute fastest disc drives you can get, get these. Namely, the Cheetah Family from Seagate. It's the world's first and only family of 10,000 RPM 3.5-inch disc drives. And it's based on the premise that saving time is as important as saving data.



At Seagate, we've known all along that fast enough never is. Just as the Seagate Barracuda™ has established 7200 RPM 3.5" disc drives as the industry standard for servers, we've upped the ante again. The 10,000 RPM Cheetah Family establishes the new standard of excellence.

Cheetah drives deliver unsurpassed performance. Start with sub-3 msec. average latency. Internal formatted transfer rates up to 16.8 Mbytes per second. Average seek times as fast as 7.5 msec. And Ultra SCSI or the Fibre Channel interfaces for



external transfer rates up to 100 Mbytes per second.

Offered in capacities of 4.55 and 9.1 Gbytes, Cheetah shares form factors, capacities, and interfaces with our popular Barracuda drives. So it's easy to upgrade your network to Cheetah.

Whether you're building enterprise servers, department servers, workgroup servers, video servers or high performance workstations, run with Cheetah. The time and data you save will blow your competition away.

For more information see us at www.seagate.com. Or call 408-438-8111.

	Cheetah 4 LP	Cheetah 9
Capacity	4.55 GB f	9.1 GB f
Interface	Ultra SCSI, Fibre Channel	Ultra SCSI, Fibre Channel
Data Rate (Internal)	11.3 to 16.8 MB/sec	11.3 to 16.8 MB/sec
Avg. Seek	7.5/8.5 msec	8.0/9.0 msec
Avg. Latency	2.99 msec	2.99 msec

 **Seagate**

Net Tools

PC MANAGEMENT

installation. Because LabExpert replaces the entire disk image, it's not possible to add or remove applications or data incrementally.

A 30-day evaluation copy of LabExpert is available from the KeyLabs Web site.

—Les Freed

LabExpert 2.0.2. List price: 10-client license, \$750. KeyLabs Inc., Provo, UT; 801-377-5484; www.keylabs.com. Circle 956 on reader service card.

On Technology Corp.

ON Command Comprehensive Client Manager

Of the four products we tested, On Technology Corp.'s ON Command Comprehensive Client Manager (CCM) is the one that most lives up to its name. CCM (\$250 per client for 100–500 users, \$200 per client for 1,000 or more users) mixes hardware and software, using Windows and Unix technologies to configure desktop PCs with operating systems and software over a network with little, if any, human intervention. Unlike Intel's LANdesk Configuration Manager, CCM does not require managed systems to have identical configurations. Given its price and complexity, CCM is best suited to large networks of 500 clients or more. We tested a Gold release candidate.

CCM is the latest incarnation of a German software product first released in 1992. The German company, CSO Software GmbH, was acquired by ON Technology in January of this year, and the software is being converted from German to English. That proved to be a continuing handicap during testing, since we did not have a German speaker on staff.

CCM uses a Solaris 2.51 server for the software distribution server, but the CCM management console is a Windows application that can run on any Windows machine on the LAN. An ON Technology representative performed the installation for us—a service the company provides for all CCM users. Because of some configuration problems with our Ultra Enterprise Server, the installation took an entire day.

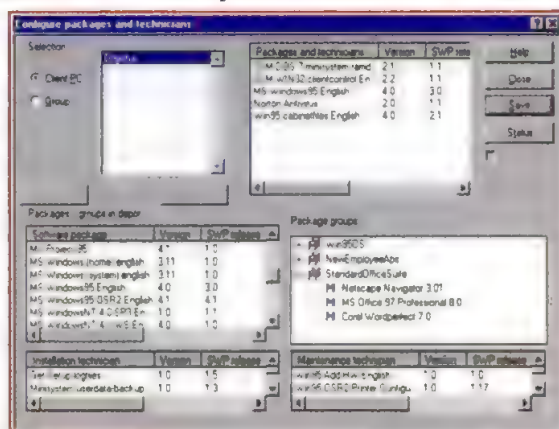
CCM client PCs use a boot PROM on the NIC or a customized boot floppy disk that allows them to check in with the CCM server before booting from the hard disk. In our initial testing using Intel PRO100B NICs on the clients, we found to our dismay that every time we powered up our desktops, CCM would erase the boot PROMs. We remedied the situation by switching to a 3Com Etherlink III 3C509 adapter. 3Com has collaborated with ON Technology to produce network interface cards with integrated boot PROMs, and an ON Technology representative told us the boot PROM manufacturer was working on the Intel problem.

As with LabExpert, the CCM server can intervene on the client PC before the client boots from its local hard disk. This preboot checking allows CCM to install the initial operating system onto a client that has not been previously connected to the LAN or to reinstall the operating system onto a crashed client PC. CCM was unique among our test products in providing a way to back up user files and machine-specific data (Registry en-

tries, driver files, and so on) and then restoring those files after an operating system installation.

Even if the CCM server allows the PC to boot normally, CCM keeps a small piece of code—the CCM Agent—resident on the client PC. The agent allows the CCM server to take control of the client and execute commands remotely. Clients can also be configured to poll the server for updates at predetermined times. If an update is detected, the clients reboot in order to accept it. Network administrators have the option of allowing a grace period for users to save their work first.

CCM performs software and OS installa-



TAKE COMMAND With Comprehensive Client Manager you can view currently installed software and install new software to clients from a single screen.

tions by sending a command script to the client PCs. The script tells the client which setup program to run in order to install the new software and contains answers to every question the setup program might ask. CCM scripts can respond to questions asked by the setup program and reply with different answers, depending on the current client configuration. In many cases they can even respond to error messages. As you might expect, the scripts are very complex. ON Technology supplies more than 100 scripts for application packages.

CCM is designed to manage large groups of PCs—from 1,000 to 5,000 or more. CCM comes with a bandwidth management utility, which we recommend. When we ran CCM at full bore, while we were formatting the hard disks and installing OSs on our test-bed, CCM used 94 percent of the bandwidth on the Ethernet pipe. —LF

ON Command Comprehensive Client Manager. List price: 100 to 500 users, \$250 per client; 1,000 or more users, \$200 per client. ON Technology Corp., Cambridge, MA; 800-767-6683; fax, 617-374-1433; www.on.com. Circle 957 on reader service card.

TCO on the Web

Many companies have entered the TCO game. Here are some URLs specifically related to TCO.

The Desktop Management Task Force is an industry organization dedicated to making PCs easier to use and less costly to manage.

www.dmtf.org/

Forrester Research offers online summaries of many of its reports. See particularly "Debunking TCO Hype."

www.forrester.com/briefs/cs970131.htm

The Gartner Group has many TCO reports available for a fee.

www.gartner.com/consulting/tco.html

IBM's Web site has many TCO solutions.

www.ibm.com/Products/netcomputers.html

Intel offers its white paper on PC management.

www.intel.com/managedpc/wired/mng_whit.htm

Microsoft has an extensive TCO white paper.

www.microsoft.com/cio/articles/cio_ent_sys_mgmt.htm

The NetPC design guidelines are available online.

www.intel.com/managedpc/decision/netpc.htm

Zona Research looks at network computers.

www.zonaresearch.com/reports/NC.htm

A virus sees no walls

between continents, nations, networks or desktops . . .

INTEL
NOVELL
NETSCAPE
SUN
CONTROL DATA
WORLD TALK
NETMANAGE
TRUST TREND

. . . which is why you'll find us

EVERYWHERE.

Find out how our award-winning products protect your business from viruses.

These products protect Macintosh and Windows PCs from viruses.

in Home and Small Business, Education, and the Enterprise.

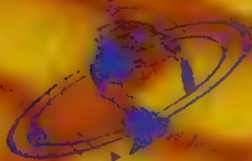
Working around the clock, we protect over 12 million users worldwide.

So, when you need complete virus protection, call Trend Micro.

We'll give you Trend products from those who know what they're doing.

www.antivirus.com/pcmag.html

1-800-238-9983



TREND
MICRO

Computer Virus Protection for the Enterprise
1-800-238-9983

Circle 17 on Reader Service Card

Microsoft Corp.

Microsoft Systems Management Server; Microsoft Zero Administration Kit

While Microsoft promises to lower your TCO with the release of Windows 98 next year, it has two products that will reduce your TCO today. Microsoft's \$925 System Management Server (\$925) and Zero Administration Kit (free) provide a comprehensive suite of tools to monitor, inventory, and manage a network of Windows 95 and Windows NT PCs. SMS features tools for hardware and software inventory, remote control, troubleshooting, and software installation. ZAK makes it simple for the system administrator to centrally control user access to client applications, control panels, and system settings. ZAK is currently available only for Windows NT 4.0 clients, but a Windows 95 version should be available by the time you read this. ZAK is actually the first piece of Microsoft's Zero Administration Windows initiative (ZAW), which will be fully realized in Windows NT 5.0 and will be a key enabler of Microsoft's NetPC architecture.

SYSTEMS MANAGEMENT SERVER

Known principally as a network software distribution tool, SMS contains a full suite of tools to help manage a network of PC and Macintosh desktops.

SMS performs three principal functions. First, it uses proprietary technology to maintain a hardware and software inventory of each machine on the network, including details on hardware types, application versions, and installed drivers. Second, SMS performs software distribution and installation over the LAN. Finally, SMS provides troubleshooting and diagnostic tools, including a protocol analyzer, remote control, and remote diagnostics. Unlike the products from Intel, KeyLabs, and ON Technology, however, SMS requires clients to be running a desktop operating system. It cannot configure a hard disk from scratch.

SMS runs on a system using Windows NT Server 3.51 or later and uses Microsoft SQL Server 6.0 or higher to maintain its database of individual machines. When you install SMS—a process that took us about an hour, including the SQL installation—the program creates a shared directory on the LAN. To register a client with SMS, you run a setup program from the shared directory; it adds a few entries to the client's StartUp program group.

Once you've registered a client with the SMS server, you may never have to visit that machine again. You can use SMS to check

the status of any client PC, and you can schedule SMS to download new software to a given client or group of clients. When the new soft-

ware is installing on the client, SMS runs the installation application and uses a script to answer all the installation questions. We found making a homebrewed script rather difficult, but SMS comes with preinstalled scripts for a number of popular applications. Its diagnostic tools allow you to view detailed configuration information on each client PC, and a built-in remote control feature allows the SMS administrator to take control of a remote PC.

SMS's protocol analyzer, Network Monitor, provides traffic monitoring, packet capture and filtering, and network address monitoring tools. It can collect data from capture agents running on multiple or switched-segment LANs.

Surprisingly, SMS isn't as Windows-centric as you might expect. SMS can manage Intel-based clients running DOS, all varieties of Windows, OS/2, and Macintosh clients. SMS runs on Windows NT Server, but it can manage machines on NetWare, IBM LAN Server, OS/2 Warp Server, and Digital Pathworks LANs as well.

Net Tools

PC MANAGEMENT

MICROSOFT ZERO ADMINISTRATION KIT

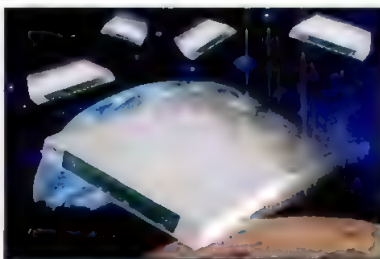
While SMS focuses on monitoring and fixing client PCs, ZAK helps you keep them

out of trouble by prohibiting users from fiddling with system settings, deleting important system files, or installing unauthorized software onto their desktops.

ZAK is actually a series of wizards that let you use Windows 95 and NT's existing system policies and user profiles to control access to troublesome areas of the client system. ZAK's functions fall into two broad categories. First, ZAK simplifies centralized management of client PCs by providing intuitive tools to manage their system policies, settings, and user or group profiles. To do this without ZAK, you'd have to use NT's arcane System Policy Editor to edit the policy settings for users or groups of users manually. Second, ZAK helps you use policies and profiles to control access to the system. Users see only what the administrator wants them to see.

It took us about 2 hours to get up and running with ZAK, which also included installing network-installable versions of Office 97 and Internet Explorer 3.0. ZAK must be installed on a domain controller running Windows NT

DID YOU KNOW YOU CAN CONNECT LAN- to-LAN OR LAN-to-INTERNET VIA ISDN?



Does your business have offices in separate locations that could benefit from Internet access to your local network?

With the ever-increasing demand for **LAN-to-LAN interconnections** and the Internet fast becoming an integral part of day to day business, you need a router that gives you both full access to the Internet and fast connections between offices.

The new **OverLAN®**, manufactured by Ringdale, is an **ISDN Router** offering the cost-effective network connectivity that your business needs at enhanced speed for faster data transmission. Gone are the usual costs and hassles associated with postage and courier services.

The **OverLAN® ISDN Router** utilizes industry-standards such as PPP (Point-to-Point Protocol) and, for faster data transfers, also supports Multilink PPP. Not only is the **OverLAN®** compatible with all industry-standard network equipment but it can also connect to your Ethernet LANs when using IP and IPX routing.

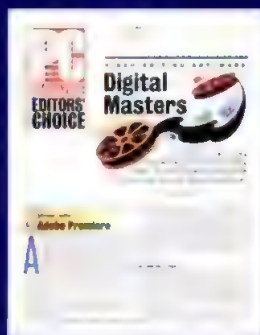
Feature oriented, the **OverLAN®** even supports bandwidth-on-demand and is equipped with security features. All of this, combined with Ringdale's one year warranty makes the **OverLAN®** one of the most comprehensive routers available today.



RINGDALE call us toll free
888 288 9080

8305 Highway 71 West Austin Texas 78735
Ph: 512 288 9080 Fax: 512 288 7210 <http://www.ringdale.com>

A GREAT REVIEW IS A GREAT REVIEW IS WORTH REPEATING WORTH REPEATING



REPRINTS

No marketing tool has more impact than a great product review in PC Magazine. Buyers know they can base buying decisions on PC Magazine reviews because our labs, writers and editors can be trusted to be thorough, fair and impartial in their testing and reporting. Get the most value out of your review with reprints. Hand them out at a trade show. Send them to your mailing list. Provide them to distributors. Add them to a press release or a mailing to your stockholders. Ziff-Davis reprints make it simple and affordable. And if you customize your reprint the value will increase even more. Call Ziff-Davis Reprints at **800-825-4237**.

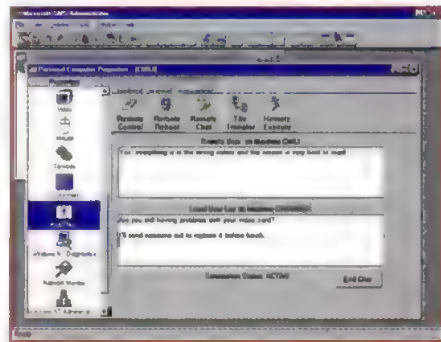


Net Tools

Server 4.0. During the installation process, we created user and group accounts as well as the policies and profile settings for those accounts. This was a key part of the process and one that can be customized to suit your needs.

After we installed ZAK, it was time to create the clients. To build a ZAK client, we connected the client machine to a shared ZAK directory on the server and ran the ZAK setup program. Windows NT Server installed Windows NT Workstation 4.0 and Office 97 on the client machine and then rebooted the client. This took about 30 minutes per client. If your users already have Office 97 and Internet Explorer 3.0 on their desktops, you won't need to reinstall the applications.

We configured one of ZAK's user environment templates and booted a ZAK client. We saw a simplified Windows desktop without Network Neighborhood and My Computer icons. Nor was there a context menu when we



CAN WE TALK? SMS's Help Desk screen lets you run programs and reboot or transfer files to the remote PC—or even chat with the user.

right-clicked on the Start menu or Desktop. The Start menu showed only the Documents and Programs groups. The Programs group contained shortcuts for the Office 97 applications and nothing else. It was simple, effective business computing with no frills and no distractions. Administrators can gain full access to the client PC by logging in with an account that has administrator rights.

ZAK provides the tools to make low-administration workstations, and it provides examples—using Office 97 and Internet Explorer—of how to build two specific computing environments. The documentation provides detailed instructions on how to roll your own suite of applications into ZAK for managed deployment over the LAN, again using Office 97 and Internet Explorer 3.0 as examples.—**LF**
Microsoft Systems Management Server 1.2. List price: With 5 client licenses, \$925. **Microsoft Zero Administration Kit.** List price: Free. Microsoft Corp., Redmond, WA; 800-426-9400, 425-882-8080; www.microsoft.com. Circle 958 on reader service card.

Your Computer Guy Will Hug You. Your Bookkeeper May Kiss You.



Save \$1,500 On The ServerSuite Designed Exclusively For Small Business.

Cheyenne®ServerSuite™ 3.0 includes three award-winning, industry-leading products that deliver a turnkey solution for all your critical server needs: storage management, anti-virus and fax communications. And for a truly affordable price. The \$995 suggested retail price represents a savings of more than 60% if each product were purchased separately.

ARCserve®, Novell's preferred storage management solution, is the industry's best-selling data backup and restore product. It gives you total protection for all of your critical data.

InocULAN®, Novell's preferred anti-virus solution, is the best anti-virus software you can buy. It offers the most advanced and comprehensive virus protection for your entire network — server and workstations.

FAXserve™, Novell's recommended fax solution, eliminates the

need for paper faxes. With FAXserve, there's no more standing at the fax machine, employees can fax right from their desktop computer maximizing productivity and ensuring privacy. All three of these outstanding products will save you time, money and frustration.

Call today and find out how ServerSuite can help your small business. And if anybody gets too close, tell them a simple thank you will do.

Call 1-800-991-4438 For A Free Trial
Or Visit Us At www.cheyenne.com/advert/ss3



How important is your data?

- ☐ Extremely.
- ☐ Life or death.
- ☐ The universe would end without it.

How important is your data? To us, it's not just crucial, it's vital. That's why we meticulously design each HP SureStore™ storage solution with one very important benefit: your peace of mind.

And that's not all. At HP, we engineer storage solutions that are not only extremely reliable, we design each one to work with leading servers, networks, computing environments and operating systems. Whatever your specialized needs, and whatever your budget, HP SureStore

products provide secure and reliable data storage. You know your data is important, that's why you need the right storage system.

Be sure it's HP.

Visit our website at www.hp.com for a complete list of HP SureStore products and specifications, or call for more information.



1-800-249-4057 DEPT.
462



TH



CD-Writer
6020e



DLT40e



M/O Library
400z



DLT Library
4115e/r



DAT24cfc



DAT24e

Net Tools

FROM THE BENCH

TELEPHONY

Voice Across the Internet

By Les Freed

By pass. The word strikes fear in the hearts of telephone company executives worldwide. We're not talking surgery here; we're talking equipment and services that let you bypass the public telephone network to establish your own private long-distance network. In the process, you can save thousands of dollars.

Bypass equipment can use a variety of media—frame relay, infrared, leased lines, radio, and satellite—to connect two or more locations. Now bypass equipment makers are turning to private intranets and to the Internet as the media for the latest generation of bypass equipment.

We took a look at voice-over-IP products from Vienna Systems Corp. and Micom Communications. Both products convert analog telephone signals into a digital datastream that can be transmitted—with no toll charges—over an existing IP network, be it the Internet or your corporate WAN.

If your company has an existing IP intranet, you can use these products to provide toll-free voice communications between business locations. Also, both products integrate well with your existing phone equipment, so users don't have to do anything out of the ordinary to place a call over the IP network.

Vienna.way

In many ways, Vienna Systems' Vienna.way product line is the opposite of the Micom V/IP Voice Gateway. For starters, the V/IP is a card that plugs into your desktop, whereas setting up a Vienna.way

system requires lots of hardware and software components.

There are differences in approach as well. The V/IP attaches to your existing telephone system and provides toll-free calling over your private IP network or the Internet. The Vienna.way augments or replaces your phone system with a network of IP-connected PCs and one or more Vienna.way servers. The servers attach to the outside world via one or more ISDN or T1 lines. IP-connected users can call each other directly, or they can call out via the phone

user names, passwords, and virtual extension numbers for all the users on the system; it knows the location and routing to all the gateway servers, and it maintains detailed logging information on each call placed.

The call-processing server and one of the gateway servers can reside on the same physical machine, and both run under SunSoft's Solaris 2.5 for x86 processors. The gateway server requires Vienna's \$4,500 proprietary Digital Signal Processor (DSP) card and one or more phone-line interface cards. Those cards are available with eight ISDN basic-rate interfaces (BRIs) or with two T1 interfaces for \$2,500 list.

You can install the Vienna Systems cards in your own PC, or you can order a turnkey system. We tested the \$6,000 model 4800, with one eight-port ISDN card and one DSP board installed, bringing the total to \$12,000.

The server software installation isn't for the faint of heart. Some Solaris tweaking is involved, and

transfer, hold, and so on) and a large GUI keypad for dialing. My.way can do just about anything a normal office PBX can do. An ancillary window can display "busy" lights for selected My.way extensions, so you can tell if a colleague is on the phone before you call.

Off-site clients, whether at home or on the road, can have their extension numbers follow them wherever they go. This feature allows you to make and receive calls from a home, a hotel room, or a client's office simply by connecting through to your ISP.

We installed the My.way client on several PCs, but we were disappointed with the hollow sound quality typical of PC speakerphones. A headset with microphone produced better sound, but headsets are a nuisance for workers who aren't glued to their desks all day long. The software-only client also requires you to bring the client software to the foreground to place and answer calls.



DOING IT YOUR WAY: The My.way interface provides the user with normal PBX functionality.

lines attached to the servers.

Vienna's system is more complex and expensive than Micom's, but it's also more flexible. The Vienna.way clients connect to the Vienna.way gateway server via IP. Any client can talk to any other client connected to a Vienna.way server on your IP network. The clients don't need special hardware; any PC with a sound board will do.

The Vienna.way system consists of a call-processing server (\$5,000 list), one or more gateway servers (\$500 list each), and any number of PC-based clients. The call-processing server maintains a database of

it's a safe bet that you'll get the ISDN configuration wrong on the first try. Our server took about 3 hours from out-of-box to up-and-running, but we had a Vienna Systems technician on-site—something we'd highly recommend for first-time installations.

Once we had the server running, we turned to the clients. The My.way client software (\$40 list) can operate as a software-only client on PCs with sound cards, or it can operate either of Vienna's two hardware-based clients.

My.way presents an attractive, colorful interface with icons for major phone functions (dial,

The two hardware-based clients offer much better sound quality, convenience, and privacy. The \$140 SerialSet looks like an ordinary single-line desk phone, but it has a DB-9 serial connector where you'd expect to find an RJ-11 phone plug. As the name implies, the SerialSet plugs into the serial port on a client PC.

The Vienna Phone.way (\$180 list) attaches to your PC's serial port and provides an RJ-11 jack that connects any ordinary telephone to the Vienna.way system. Both the SerialSet and the Phone.way provide better audio quality than the PC's speaker and

microphone, and both allow you to dial and answer calls directly without the software interface.

The Vienna.way uses several audio codecs, depending on the source and destination of the call. Calls placed on the LAN use the G.711 compression codec, which provides excellent, real-time audio over a 64-Kbps channel. Calls between gateways or to dial-up clients use only 3.4 Kbps of bandwidth in order to minimize the load on your WAN.

As with the Micom system, there's a small but noticeable delay in calls placed with the Vienna.way, particularly on calls placed through the Internet. The audio quality on long-haul calls using the 3.4-Kbps codec is of noticeably lower quality than a traditional long-distance call, but the very low cost of the call more than makes up for the reduced quality. **Vienna.way.** List price: Tested configuration, \$12,000. Vienna Systems Corp., Kanata, Ontario; 613-591-3219; fax, 613-591-9973; www.viennasys.com. *Circle 951 on reader service card.*

Micom V/IP Voice Gateway

As opposed to the Vienna.way server-based solution, the \$1,750 V/IP Voice Gateway, from Micom Communications, is a full-size ISA card that installs in virtually any 486 or better desktop. The V/IP card provides two analog telephone-line connections that can connect to your company's phone system or directly to a phone or fax machine. But as with the Vienna.way system, once everything is in place, you can start making calls over an IP network.

The V/IP card requires only minimal support from the host PC; all the heavy-duty signal processing and analog-to-digital conversion are handled by the V/IP's own CPU. You use the V/IP software to install, configure, and monitor the V/IP card. Once the card has been configured, it uses the PC's Ethernet interface for its IP connection.

The V/IP software is available for DOS, Microsoft Windows 3.x, Windows 95, and Windows NT. We tested the POTS version of the V/IP system using two Pentium/90

Net Tools

FROM THE BENCH

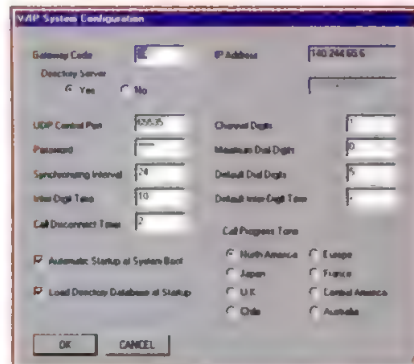
PCs running Windows 95. We connected them via a 10-Mbps Ethernet LAN, but the V/IP system will work over virtually any IP network, including dial-up modem links. Each two-way conversation requires 8 Kbps of bandwidth, so the V/IP system doesn't add much load to your WAN.

Installing the V/IP card takes only a few minutes. There are several jumpers on the card that must be set before installation, but a detailed installation guide walks you through the process. The Windows 95 software installs from two floppy disks, and you use a series of configuration menus to set the card's IP address and phone extension number.

Once you've installed and configured the V/IP system, it oper-

ates much like the public telephone network. To place a call, you pick up the phone, dial the access code for the V/IP system, and dial the extension number that you've previously assigned for the remote V/IP system.

Depending on how the V/IP card is configured, users at either end of the link can use the V/IP to place outbound calls on the remote system's PBX. This arrange-



SIMPLE INSTALLATION: V/IP runs through a simple set of menus.

ment allows users in one office to make local calls in another office's city without toll charges.

MULTIPLE ACCESS

A Three-Way Split

In nature, anything big develops cracks. Like all big things, the Internet and intranet market is beginning to crack along different areas of interest and occupation. The divisions of interest aren't clear-cut, but at *PC Magazine* we've been able to map out where the market is going and what you

need to know. We see the Internet and intranet product areas generally splitting into three parts: desktop, development, and infrastructure. The desktop area covers everything that hundreds of clever companies present on your screen. *PC Magazine* as a whole is tightly focused on this area. The interests of developers range from getting juicy programming hints to understanding the techniques of Web-site management, and our venerable PC Tech section serves this area beautifully. But infrastructure belongs to us.



Frank J. Serfles Jr.

Coverage of networking infrastructure products has been a part of *PC Magazine* since before I founded PC Magazine LAN Labs in 1986. For the past few years, we have provided in-depth information on networking products in a demographic section mailed to selected subscribers. But the primary

growth in networking is in smaller organizations. People with every kind of job title face the challenges of integrating computers into networks, establishing intranet servers, and providing remote access while maintaining security. With that kind of growth pattern, we have to do more than send a special edition to IS managers.

This new section of the magazine, Net Tools, is aimed at organizations with networks of 4 to 400 nodes. The big networking companies, like Bay Networks, Cisco, Hewlett-Packard, IBM, Intel, and 3Com,

have new products in these areas. Companies with a smaller market share, such as Accton, Allied Telesyn, Asanté, Axis, Compaq, Dayna, Digi, D-Link, Kingston, LANart, Shiva, SMC, and dozens more, have always brought innovation to this market. Our goal is to cover them all.

We'll use the power of PC Labs to focus on what I call the "ilities": the affordability, scalability, reliability, and other factors that differentiate products today. You'll see the familiar *PC Magazine* comparative review format focused on networking infrastructure here in Net Tools.

Affordability and practicality are particularly important review criteria for us. This Net Tools issue, with its focus on reducing the total cost of ownership, is a good example. We're happy to report that you can do the most important TCO-reduction tasks right now. On the practical side, we're doing interesting things—like trying various Plug and Play LAN adapters in PCs with no free IRQs—just to see what happens. We're also delving into IP telephony, fax alternatives, management tricks, and, of course, a big bin full of network tools. Come back often and join the fun!

Our new Smart-UPS® ensures the web hits you *want...* and prevents those you *don't*

Web-enabled PowerChute® *plus* now ships with every Smart-UPS®

Whether you're using the web to sell or support, once you invest in a web server and operating system, you've made a commitment to yourself, your company and your customers. However, without power protection, you risk losing your expensive software, hardware, and data, and the opportunity to interface with new prospects and existing customers. That's why the world's most reliable power protection is now available to meet your web-based needs.

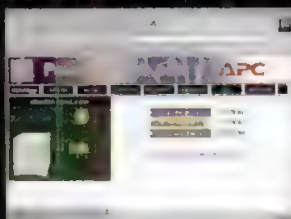
Smart-UPS® ensures your web server is always there, like you promised. Don't become a statistic! Power problems damage hardware, and are the leading cause of data-loss.

APC Smart-UPS ensures protection from surges, spikes and lost power. Backed by a \$25,000 lifetime equipment protec-

tion guarantee, Smart-UPS brings the confidence of APC to the excitement and opportunity of the Web.

All 120V Smart-UPS now include FREE Web enabled PowerChute *plus* software for safe web server and OS shutdown. PowerChute *plus* protects system and data integrity by automatically shutting down server applications and operating systems.

PowerChute *plus* FlexEvents feature can page you when an out-of-bounds environmental condition occurs. APC's NEW WebAgent™ allows administrators to manage their Smart-UPS via their browser. NEW WebAlert™ notifies users of Web server shutdown.



Smart-UPS now ships with PowerChute *plus* power management software with WebAgent, to make Smart-UPS browser-manageable. (Ships free with 120V Smart-UPS only)

Instead of increasing your risk by waiting, join over 8,000,000 satisfied computer users worldwide who prefer APC to protect hardware and data.

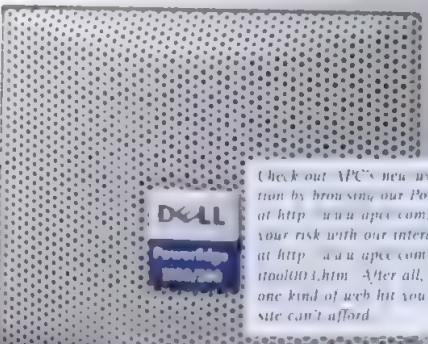


APC's award-winning Smart-UPS units are available in equipment rack-mount models. The Smart-UPS XL series is recommended for long runtime applications. For maximum protection, ask about our new "Watchdog" premium risk evaluation for all server and networking equipment sales.

APC's MasterNet™ provides Web-SNMP manageable independent control of power to critical network nodes.



"...Inherent flexibility and excellent software. Don't be caught without one"



Check out APC's new web solution by browsing our PowerPage® at <http://www.apc.com>, or assess your risk with our interactive quiz at <http://www.apc.com/english/tool001.htm>. After all, there's one kind of web hit you and your site can't afford.

To receive FREE information about PowerChute *plus* with WebAgent, just complete this coupon and mail or fax to APC

☐ **YES!** I'd like more information about new PowerChute *plus* software with WebAgent.

☐ **NO** I'm not interested at this time but please send my FREE Power Protection Handbook.

Name _____

Title _____

Company _____

Address _____

City/Town _____

State _____ Zip _____ Country _____

Phone _____

Brand of UPS used? _____ # _____

Brand of PCs used? _____ # _____

Brand of Servers used? _____ # _____

APC
(888) 289-APCC x8187

Dept. 64 BU

©1997 APC. All trademarks are the property of their owners. SU02EF (800)347-FAUX PowerFax E-mail: apcinfo@apcc.com 132 Fairgrounds Road, West Kingston, RI 02882 USA

APC is the most reliable brand for reliability in a UPS. UPS vendors complain.



CIRCLE 162 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

CROSS TALK



Frank Dorfler

I never thought I'd consider the 30- to 3,000-Hz sound of the typical telephone system as "good" audio quality, Leon, but it's the standard of excellence for voice over IP systems. I know that bypassing the commercial telephone lines is popular, but I'm not sure the cost is worth the strain.

Calls connect very quickly, and the audio quality is very good. We did notice a slight delay in the conversation that was directly related to the load on the IP network at any given instant. We used the traffic generator function on a protocol analyzer to load our test LAN with up to 50 percent bandwidth utilization. The delay increased slightly but was still barely noticeable.

Unlike with the Vienna way, mobile PC users cannot access the V/IP system to make calls from

The cost savings could be substantial, Frank, especially on international calls. Many North American companies claim that more than half of their revenue comes from business done abroad. And some places where you can't get dial telephone lines, you can get shared Internet access.



Leon Erlanger

customer locations or a hotel room. Micom has announced support for the H.323 conferencing protocol in the next release of the V/IP. This will allow users of Microsoft's NetMeeting and other H.323-compliant packages to access the V/IP gateways from any dial-up IP connection.

V/IP Voice Gateway. List price: \$1,750. Micom Communications, Simi Valley, CA; 805-583-8600; www.micom.com. Circle 952 on reader service card.

NETWORK SECURITY

Finding the Security Holes

By Padraic Boyle

A leader in security analysis tools, Internet Security Systems (ISS) is looking to enter the security market from the other side of the fence—security enhancement. RealSecure 1.0 for Windows NT 4.0 is designed to alert you to holes left by insufficient or misconfigured firewalls and to secure internal networks from hackers before they can do damage. But its relatively high price (\$4,995 list for a single host and \$19,995 list for five hosts) and the price of the hardware to run it on—ISS suggests a Pentium/200 with 64MB of memory—may put this solution out of reach of many IS departments.

Even though RealSecure filters packets like a stateful-inspection firewall, it isn't a firewall. RealSecure is positioned as a comple-

mentary piece that works in conjunction with the established corporate firewall system. RealSecure examines data flowing through a network segment—transparent to both the end users—and the network performance. This unobtrusive design provides real-time packet analysis without degrading network performance.

When we threw several attacks—Syn floods, FTP vulnerability checks, WinNuke, and ping floods—at the network, RealSecure caught them all without affecting network performance.

RealSecure is broken up into two components: an engine, which filters and analyzes the secure network segment, and the console, used to configure and monitor the engine. We found configuring and installing RealSecure an easy task. We were able

Net Tools FROM THE BENCH

to configure and monitor all of the engines on our test-bed from a single management console.

At the core of the RealSecure engine is the attack signature database, based on a list of known attack signatures supplied by ISS. RealSecure uses filters to check traffic on a network segment. It copies the packets into memory and analyzes them to see whether any packets fit the filters' profiles.

Each engine requires a dedicated server running Windows NT 4.0 with enough power to handle the traffic flow of your network. ISS suggests a Pentium/200 or better processor, 64MB of RAM, and an Ethernet adapter capable of running in promiscuous mode. However, the engine and console may run on the same Windows NT host. RealSecure currently supports only 10-Mbps Ethernet currently, but the company plans to support Fast Ethernet and FDDI. RealSecure is also available for Unix platforms.

The RealSecure engine sits on a network segment, where it gathers and views the flow of packet traffic. Acting like a packet sniffer, the engine gathers all of the packets delivered over a segment and analyzes the packet contents. Like a packet sniffer, RealSecure cannot operate through routers. You'll need to install an engine on a per-segment basis.

The graphical centralized management console must run under Windows NT Client 4.0. You can use the console to choose filters, which, with the help of a database of attack signatures, you can customize for the most up-to-date known attack methods.

Installations that host their own Web servers and FTP servers may find RealSecure a great solution for automatically monitoring traffic between their routers and

firewalls. The multiple engines are also useful for monitoring the traffic flow in and out of higher-security areas such as the payroll or legal department. In many cases, the best course is to start by monitoring traffic on both the DMZ and the trusted portion of your network.

RealSecure uses predefined and user-defined filters to perform such tasks as logging an offending system's IP address, sending an alert via console screen and pager, and killing the connection between the offending system and the host under attack. Filters can also detect a host of attacks including Syn floods, UDP bombs, and Satan scans.

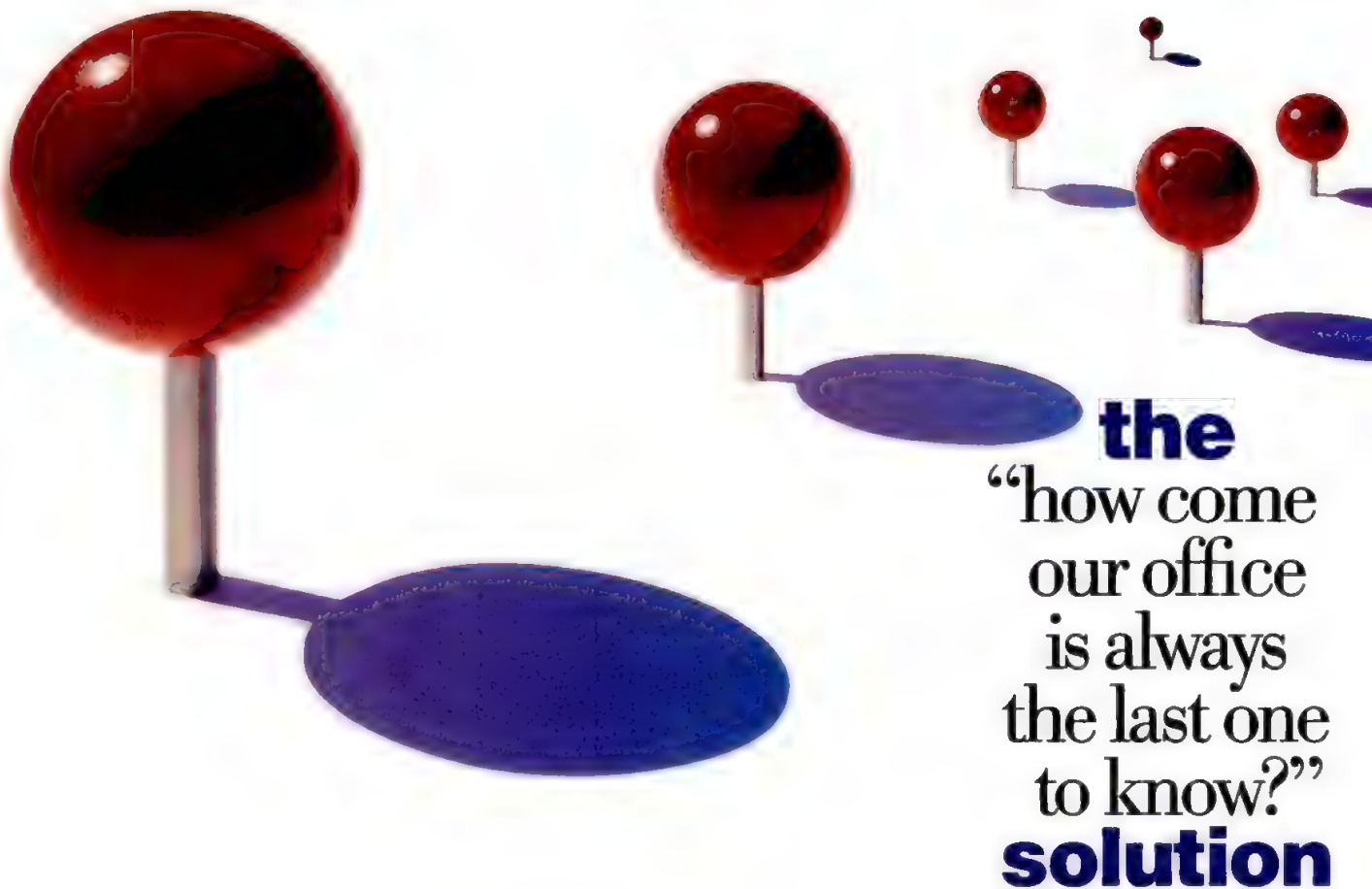
To help find the cause of suspicious events, RealSecure logs statistics including source and destination addresses, time of day, and port number. Because the logs are stored as an ODBC database, you can export the data to another application for further analysis.

In addition to tracing, logging, and killing connections, RealSecure can also keep internal



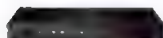
LOOKING BOTH WAYS: RealSecure can watch traffic going both into and out of the LAN.

clients from accessing a specific IP address—a Web site perhaps—over the Internet. But other products such as proxy servers are better at this type of site management. **RealSecure 1.0 for Windows NT 4.0.** List price: Single host: \$4,995. Internet Security Systems Inc., Atlanta; 800-776-2362; 770-395-0150; www.iss.net. Circle 953 on reader service card.



the
 “how come
 our office
 is always
 the last one
 to know?”
solution

There are all sorts of complicated ways to get your offices back on the same page. And then there's the easy way. Our IBM **LAN interconnect solutions** work with the products you already have in place to connect your remote office LANs in a single integrated network. Our 2210 and 2216 family of multiprotocol routers, for example, feature open standards, so you can avoid getting stuck with proprietary technology. You'll also find them easy to operate. A trait they share with all our network solutions. And when you need support or service, we're behind you every step of the way. Call 1 800 IBM-2468, ext. DA011, for the name of your nearest IBM Business Partner™ and find out how much smarter your company will work once **everyone is connected**. Or visit us at www.networking.ibm.com/netad. Solutions for a small planet™



2210 multiprotocol routers provide an extensive range of connectivity to fit your needs.



Nways™ management software helps you manage your networks, including traffic and performance monitoring.



IBM integration connects all your PC servers to create a corporate intranet.



IBM service and support means we'll be there for you 24/7 to help manage anything you can't.



One of the many solutions available from our Business Partners.

WANT PLUG-AND-PLAY
NETWORK PERIPHERALS?

THINK THIN



MAKE YOUR NETWORK PERIPHERALS HUM
WITH THINSERVER™ TECHNOLOGY PRODUCTS,
ONLY FROM AXIS.

Think print servers are a good idea for your network?
You should see what Axis Communications is up to now.

Using ThinServer Technology, our complete line of products make it easy and affordable to connect your peripherals to any size LAN, from workgroups to the enterprise. Put live pictures on the Web and Intranets for monitoring and security with our Internet Camera server. Access CD-ROMs across your enterprise with our AXIS StorPoint CD™ server. Share Iomega® Jaz™ removable drives with our AXIS StorPoint HD/4 Jaz™ tower. And more ThinServer peripheral products are on the way — including the latest advances in print servers.

ThinServer Technology includes "thin" versions of the most popular network operating systems, Web

What is ThinServer Technology?

*It's a breakthrough technology
that makes peripherals of
all kinds "network-ready."*

*Access everything from printers and
storage systems to digital cameras and
CD-ROM drives —
with no intermediate
PC client or server. Your customers'
peripherals work faster and smarter.*

Everything is plug and play!

management tools and Axis' own ETRAX 32-bit RISC processor — based on open architecture, streamlined and optimized for device connectivity, independent of any file server. So you can keep network traffic to a minimum and offload your file servers.

It's an idea whose time has come.
It's revolutionizing the way users
access peripherals over the network.

And it's only from Axis Communications.

Free White Paper! To receive a free White Paper on ThinServer Technology, visit our Web site at www.axis.com or call us at 800-444-AXIS*. And see how peripheral servers can give your network new life.

AXIS
COMMUNICATIONS

Axis is a registered trademark, and StorPoint CD, StorPoint HD/4 Jaz and ThinServer are trademarks of Axis Communications AB.
All other company names and products are trademarks or registered trademarks of their respective companies.

* GSA prices available. Call for more information.

CIRCLE 355 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

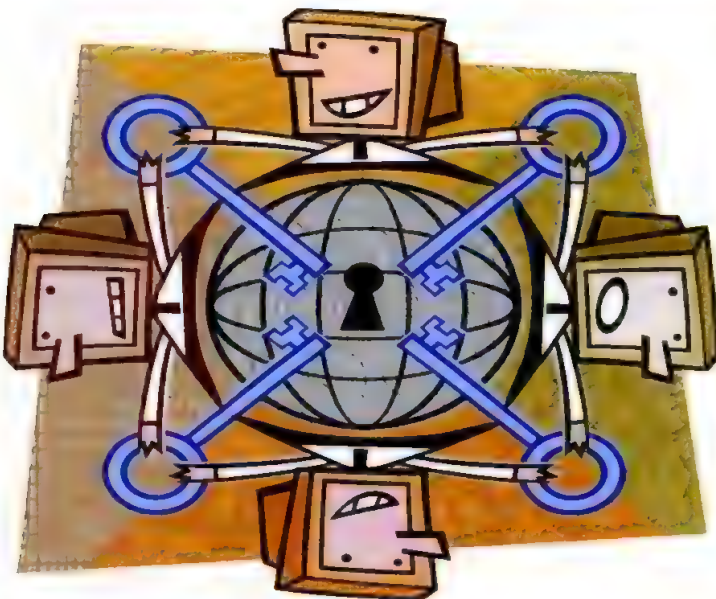
Visit Axis Communications
at Networld + Interop, Atlanta, GA
October 8-10, Booth #5553
and register to win a ThinServer suite of products!

Net Tools

INTERNET TOOLS

INTERNET SECURITY

Drill a VPN Through the Internet



Remote-access and wide-area network bills getting you down? Consider using the Internet as a virtual private network (VPN). VPNs can replace troublesome remote-access systems and costly WANs. Instead of getting billed for expensive remote-access 800 numbers, you can give your remote and mobile users \$20 per month ISP accounts and greatly reduce your

remote-access costs. Making your corporate application servers, such as Lotus Notes, available across the Internet to these users (and hopefully only these users) lets them access these corporate services from nearly anywhere. The same technology makes it simple to connect your host systems as well. Why not replicate Notes databases across the Internet or route Microsoft

Exchange mail between servers instead installing leased lines?

LOOKING AT THE PIPE

Today, conventional WANs follow and often blend two infrastructure models. In the oldest model, used predominately in North America, leased telephone lines connect routers at corporate locations. A leased-line WAN system is secure and reliable, but it's expensive. For the past few years, leased-line systems have been getting phased out in favor of frame-relay subscription services. Frame-relay systems offer lower costs and more flexibility, but they could have lower reliability than the leased-line systems.

The allure of an Internet-based VPN is that you can duck paying high monthly charges, and your corporate road warriors can dial in from practically anywhere. However, you have to keep your company's data secure from the prying of Internet denizens, and you must understand the limits of Internet throughput and reliability.

When you send your corporate data over a VPN drilled through the Internet, your data is contending for bandwidth and router services with data from every downloader and game player on the Net. There are no guarantees of connections or levels of throughput. Some larger ISPs, such as BBN Planet, MCI, and UUNet,

are considering providing service guarantees across their own backbones, but this will only work if both sides of the connection stay within the same ISP. And when service guarantees do become available, you can expect to pay considerably more for the service than what you're paying today.

Today, you need to choose your Internet VPN traffic wisely. An Internet VPN is great for smart applications like e-mail gateways and replicating clients that can work through disruptions and delays. An Internet-based VPN is not the place for data carrying critical transaction updates or streaming video.

An Internet-based VPN is not the place for data that carries critical transaction updates or streaming video.

KEEPING DATA SAFE

The focus of VPN components is encryption. The goal is to limit not only which users and hosts have access to your corporate systems, but more important, to ensure that the data transmitted over the Internet is encrypted so that only authorized system hosts and remote users see the data. A VPN needs complete end-to-end packet encryption. The technique used to wrap encrypted payloads with openly read headers is called *tunneling*.

Encryption is the centerpiece of many new VPN products, such as Signal 9 Solution's Con-Seal Tunnel (starting at \$500 per node, 613-599-9010, www.signal9.com)—a software-based VPN that runs on Windows 95 and

The Internet VPN Process

1. A client computer calls its local ISP and connects to the Internet.

3. The encrypted packets are wrapped in IP packets to tunnel their way through the Internet.

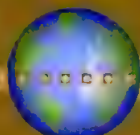
4. The VPN server negotiates the VPN session and decrypts the packets.

2. Special client software recognizes a specified destination and negotiates an encrypted VPN session.

The Internet

High-speed corporate Internet-access link

5. The unencrypted traffic flows normally to other servers and resources.



Windows NT 3.51/4.0.

However, many VPN products are actually extensions of existing Internet components with a new emphasis put on encryption. You can find VPN encryption options cropping up in traditional Internet components such as Aventail's proxy-based Mobile VPN server, Checkpoint Software firewalls, Cisco routers, and Microsoft's Windows NT Server 4.0 network operating system.

Besides encryption, VPNs rely on IP hiding and translation techniques found in proxy servers, routers, firewalls, and network operating systems such as Novell's IntranetWare 4.11 and Windows NT. For example, Aventail's Mobile VPN Server (starting at \$4,995, 206-777-5600; www.aventail.com) is built on top of a proxy server to keep users and hosts on the Internet side from seeing and communicating with IP hosts on your private network. Firewalls, too, play a part in the VPN architecture by determining what VPN addresses should be encrypted before transmission across the Internet.

BETTING STARTED

Ready to build a VPN? Start by taking a look at the architecture. On one side, individual clients and LANs access the Internet. The Internet sits in the middle, perhaps supplemented by frame-relay or leased-line service. On the other side, your central network has a high-speed connection to an Internet service provider.

Your VPN services, whether they're running on a firewall, NOS, proxy server, router, or standalone VPN system, reside outside of your corporate network.

At the client side is a typical Windows 95 PC with an IP stack. There is also a piece of client software provided by your VPN vendor, such as VPNet's VPNClient. VPN clients are implemented differently, but at the most general level, they insert authentication and encryption software between your Winsock API and the application, such as the Lotus Notes

client or a browser.

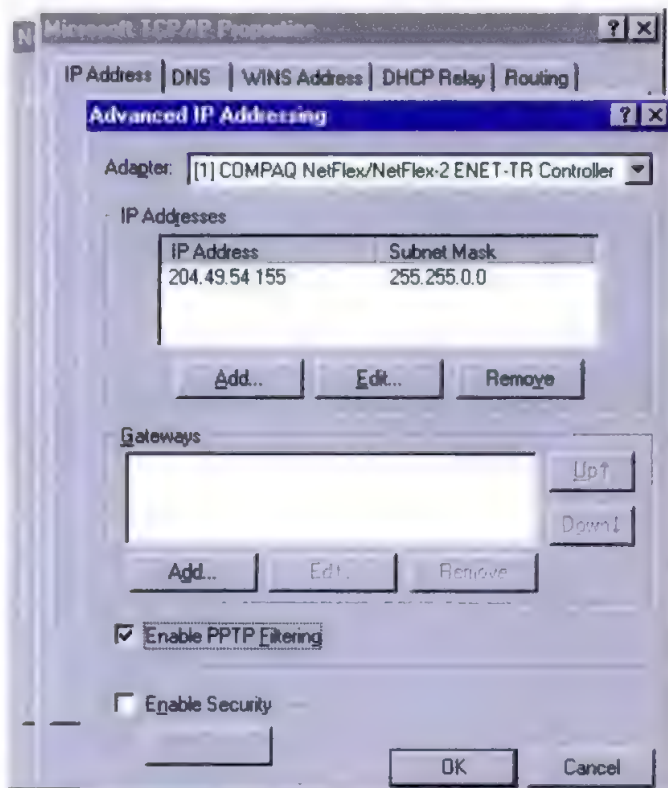
These remote users still run their normal ISP access software such as Windows 95 Dial-Up Networking. But when your user attempts to access the corporate application by connecting to a host on your VPN, the VPN client software enforces another layer of authentication and begins encrypting all of the data sent between the host and client. Since end users will not always need VPN connectivity, for example, when just surfing the

Net Tools

INTERNET TOOLS

ample, VPNet's products, the VSU-1010 VPN Service Unit and the VPNclient (starting at \$3,995 for server and \$99 for client, 888-876-3888, www.vpnet.com) use encryption based on the U.S. government-approved Data Encryption Standard (DES).

Many standards are still evolving.



VPNs FOR THE MASSES: PPTP support currently exists in Windows NT (shown above) and as an upgrade to Windows 95.

public Internet, the clients are usually smart enough to stay out of the way when not connected to your company's VPN. If you use your ISP's own VPN services, you may not even need this extra client software, as the ISP will handle the encryption and authentication between its servers and your corporate VPN solution.

As is typical with networking, some parts of this technology are proprietary and other parts are based on open standards. For ex-

ample, The Point-to-Point Tunneling Protocol (PPTP), developed by Microsoft, 3Com, and a consortium of other vendors, sets up the secure transaction and describes how encrypted packets will be wrapped in IP packets. PPTP is currently part of Windows NT and is available as an upgrade to Windows 95. However, Cisco countered this group's development with its own Level 2 Forward (L2F) protocol. The Internet Engineering Task Force (IETF) is in the process of devel-

oping a standard, referred to as L2TP, that will try to satisfy everyone. The IETF is also working on a new secure IP standard called IPSec, which will standardize authentication and encryption at the IP level.

The vendor's implementation of the encryption technology determines both the level of security and ease of access to your VPN. DES, with its single key system, is easier to distribute but less secure than a two-key system, since you don't know for sure who the user is. Public key systems make it more difficult for someone to pretend that they're an approved user, but these systems are harder to implement since each user must have two keys. Some vendors, such as VPNet, include public key management as a feature of their products.

You should consider carefully how you'll use your VPN. For example, if you want to allow your business partners and clients access to your system, you might consider using the single-key approach if you can find a secure way to distribute the key.

On the server side, if your VPN services, such as a firewall or proxy server, run on your own hardware, you should be aware that the encryption process could add a significant CPU load. We recommended using a separate PC to run the VPN system in order to maintain performance, security, and overall system reliability. As with anything in networking, the amount of data and number of users will greatly effect the VPN performance.

There's clearly no limit to the availability of VPN products. Most of the big players including Bay Networks, Cisco, Microsoft, Novell and 3Com have announced VPN strategies. Even if you don't consider using VPNs as a complete replacement for your WAN, you may find that, for remote access or for access between your smaller branch sites and headquarters, a VPN is worth some investigation.—Tony Pompili



FLUKE®

You can't go out and troubleshoot everything yourself. But you can send out an assistant.

Introducing the OneTouch™ Network Assistant, the fast and easy front-line troubleshooting tool that anyone can use.

There comes a point where you just can't troubleshoot everything yourself. But now you can send out an assistant and know the job will get done right — with a Fluke OneTouch Network Assistant.

The new OneTouch is the first tool designed for fast and easy front-line troubleshooting in Fast Ethernet networks at local or remote sites. So it's perfect for network technicians and Help Desk staff responding to trouble tickets.

Functions like moves, adds, and changes are

handled quickly and easily thanks to an icon-based interface and a touch sensitive screen. And it's available in both 10Mbit and 10/100Mbit versions.

In short, it's the best way to delegate front-line troubleshooting as your network and responsibilities grow.

See for yourself what an assistant can do for you with our free new OneTouch demo disk. Call Fluke today at 1-800-44-FLUKE. Or visit our website at www.fluke.com/nettools/.



© 1996 Fluke Corporation. P.O. Box 9090, M/S 250E, Everett, WA, USA 98206-9090. U.S. (800) 44-FLUKE or (206) 356-5400. Canada (905) 890-7600. Europe (31 40) 2 678 200. Other countries (206) 356-5500. All rights reserved. FLU-303-101



CIRCLE 152 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

ARE THOSE HOT NEW PCs OF YOURS REALLY SCREAMING FOR **MORE MEMORY?**



WHAT HAPPENS when you skimp on memory for those hot new PCs? Without enough memory, your PC uses hard drive space as "virtual" memory. That can slow even the fastest processor to a crawl. But, a



Kingston® memory upgrade can correct the problem. An upgrade from 16MB to 64MB can increase performance by up to 63%.* The quality of the memory is critical, too. So Kingston has created the memory industry's most rigorous design,

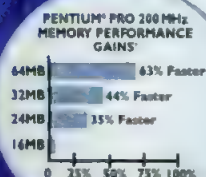
manufacturing, and testing procedures

www.kingston.com/ad

To find out more, call (800) 337-3807
Or just visit our Web site

Kingston
TECHNOLOGY

COMPUTING WITHOUT LIMITS.™



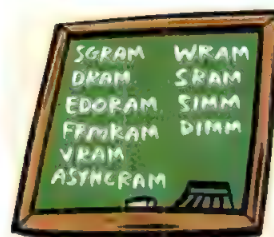
*Base Configuration: CPU - Pentium Pro 200 MHz, RAM - 16MB, OS - Windows NT 4.0, Benchmark - WinStone 32. *Upgrade from 16MB to 64MB. Testing was conducted by an independent service for Samsung Semiconductor Inc., Kingston Technology Company, Ltd., New Hope, NJ, and Micron Technology, Inc., Fremont, CA 92708 USA, (714) 435-2600, Fax (714) 435-2699. © 1997 Kingston Technology Company. All rights reserved. Computing Without Limits is a trademark of Kingston Technology Company. All other trademarks and registered trademarks are the property of their respective owners.

PC MAGAZINE CIRCLE 106 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

PC Tech



INSIDE



TUTOR: Confused by terms like EDO RAM and WRAM when choosing memory? We sort them out for you with a helpful glossary of acronyms. *Page 267.*

POWER PROGRAMMING: Jeff Prosize adds methods and properties to turn a sample application program into an automation server with a hierarchical object model. *Page 271.*

C++ Code Profilers

We look at four analysis tools for detecting inefficient code in your Visual C++ programs.

By Steven E. Sipe

A Windows software developer faces many challenges, not the least of which is to deliver lots of features without sacrificing performance. As a program grows in complexity, size, and number of features, its performance inevitably tends to suffer. And since end users often cite performance as a major contributor to overall satisfaction with a program, poor performance can hurt even the most advanced and feature-rich applications.

Poor performance has plagued Windows applications from the beginning. The complex graphical interface requires many lines of operating-system code just to place a single character on the screen. Video card manufacturers quickly responded to poor graphics performance by creating graphics accelerator cards

that replaced many lines of operating-system code with hardware implementations. Unfortunately, no such accelerator cards exist for software applications. Developers face the agonizing necessity of examining each line of code to spot inefficiencies, a laborious task often complicated by the fact that code bottlenecks aren't always obvious. A function may appear to be efficient on its own, yet it may be called so many times that it becomes a bottleneck within the larger context of the application. Spotting such inefficiencies can be close to impossible and is at best very time-consuming when you are dealing with a large application containing many thousands of lines of code.

The recent trend toward component-based software development further adds to the difficulty of spotting code inefficiencies. A typical Windows application contains executable code



UTILITIES:

Foneword/32 tells you what words your phone number spells out using a slick, cellular telephone-like interface and an 80,000-word dictionary. *Page 281.*

SOLUTIONS: What to do about a hard disk that's losing an inordinate amount of storage space; an auto-numbering function for Microsoft Access queries; and more. *Page 287.*



from many different sources. An Internet application, for example, might use ActiveX controls, Open Database Connectivity (ODBC) database drivers, and third-party DLLs. In addition, it most likely is built on an application framework, such as the Microsoft Foundation Classes (MFC).

Fortunately, there is some relief for the weary Windows application developer: *code profilers*, powerful tools that help developers isolate and remove the performance bottlenecks from their applications. A code profiler tells you where your application is spending its time. It analyzes your program's execution, so that you can determine where your code is performing inefficiently (and also where it is performing efficiently). You can even distinguish between code that is itself inefficient and code that has become inefficient by being called an excessively large number of times. And by indicating how often each piece of code is called, a profiler can show you where fine tuning would yield the greatest overall performance benefits.

HOW DO PROFILERS WORK?

Profilers collect detailed execution information about each function in your application. A profiler's goal is to provide explicit performance reports that indicate how much time a particular function takes to execute as well as how often it is called. The technique used to collect that information depends on the profiler but generally fits into one or more of the following categories:

- **Time sampling.** The profiler executes your program and takes regular samples of the processor's instruction counter. Monitoring the instruction counter gives the profiler an

idea of the area of your program that is currently executing. The profiler uses that information to collect timing data for each function in your program. Profilers using this technique often work in conjunction with the linker's map file, in order to get functions' addresses. Because this type of profiler also requires access to your source code, it can't monitor the performance of external components linked into your application.

- **Source code insertion.** The profiler uses performance monitoring (instrumentation) code

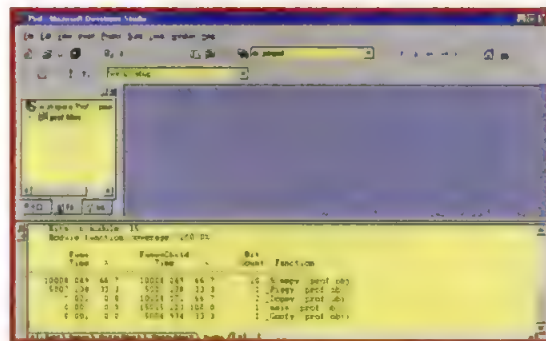


FIGURE 1: Microsoft Visual C++ 5.0, with a profiling window detail report.

inserted into your program to determine what function is executing and to gather timing information about it. You must recompile your application's source files with the additional instrumentation code. Like time sampling, this technique can't monitor the performance of external components linked into your application.

- **Binary instrumentation.** The profiler analyzes the binary sequences in your executable and produces a new executable that contains instrumentation code. The instrumentation process can be very time-consuming,

but it has one big advantage over the other two techniques: It allows profiling of any precompiled external components you've linked into your application.

To pinpoint poorly performing functions, you must be able to distinguish between the time a function consumes performing its own operations and the time it consumes calling other functions—its children. In general, most profiling tools have that capability, though with varying levels of detail. A more sophisticated profiler might break down the time consumed

by child functions in such detail that you can determine how much time each one consumes. Ideally, you should be able to view a function, find the poorest performing child function, and then determine from analysis of the child why it performs so badly.

Keep in mind that profiling is an iterative process. That means it's a multistep process that must be performed over and over. A good profiler allows you to profile your program quickly, analyze the results to spot problem areas,

make corrections in your code, and then begin the process again. Since profiling is an iterative process, a profiler must be fast, intuitive, and thorough. Otherwise, the time saved by using one might be minimal at best.

Microsoft Corp.

Microsoft Visual C++ Professional Edition

Microsoft Visual C++ 5.0 Professional and Enterprise editions include Microsoft's code profiling tool, which uses the time-sampling technique described earlier. The profiler does not provide a direct way to monitor the performance of external components.

Setting up your project for profiling is a simple process. You start by choosing the *Project | Settings* menu option and selecting the *Linker* tab. Next, check the *Enable Profiling* check box and click *OK* to save the new settings. Note that changing the project options requires you to rebuild your application for the changes to take effect.

Once you have rebuilt your application, you can begin profiling by choosing *Profile* from the *Build* menu. The profiling options screen appears and offers several choices, among them *Function Timing*, *Function Coverage* and *Line Coverage*. *Function Timing* measures the time consumed by each function in your program, both on behalf of itself and on behalf of its callers. *Function Coverage* produces a report that indicates

PROFILERS AT A GLANCE		
	PROS	CONS
Microsoft Visual C++ 5.0	• Already included with the compiler at no extra cost. • Well integrated with the Visual C++ IDE. • Good performance.	• Does not provide detailed parent/child function-timing information. • Does not offer advanced options, such as excluding functions. • Cannot profile external components.
HiProf 1.01	• Profiles external components. • Offers very detailed parent/child performance information. • Offers many advanced features, such as excluding functions.	• Hierarchical View is not as intuitive as it could be.
Visual Quantify (Beta 2)	• Profiles external components. • Call Graph is good for showing parent/child relationships and execution timeline. • Offers many advanced features, such as excluding functions. • Supports Java profiling.	• Fairly expensive; costs about the same as the compiler. • Does not support Windows 95. • Detail screen navigation is awkward.
VTune 2.4	• Profiles external components. • Supports Java profiling. • Provides complete systemwide profiling.	• Multitasking user interface clutters the desktop. • Difficult to learn, even with help from the VTune Assistant.

Editors' Choice

• HiProf 1.01



Each of the tools in this roundup has its own strengths, but

TracePoint Technology's HiProf stands slightly ahead of the pack. It offers a very good balance of features and ease of use. Its ability to provide performance information for each line of source code and for external components is a real plus.

HiProf's graphical Hierarchical View also provides a good way to see detailed performance information for each parent function in conjunction with each child.

Honorable mention goes to Visual Quantify. Its Call Graph window provides an intuitive high-level view of your application's path of execution as well as a good level of detail about the performance of child functions. Visual Quantify is a solid product that appears to follow in the footsteps of Pure Atria's fine Purify debugger. Perhaps its greatest weaknesses are its lack of support for Windows 95 (in that respect, it is alone among the tools in this roundup) and its cost, about twice that of the other tools reviewed here.

whether a particular function is called, and *Line Coverage* produces a report that indicates whether a particular line of code is called. The last two options fit into the more general category of code coverage, which helps you find code in your application that is never called. In this roundup, we've focused on performance profiling.

Visual C++'s profiler is a fairly simple tool that is integrated well with the Visual C++ IDE. When you run the profiler in the IDE, it displays its results in the output window (see Figure 1). The detailed report provides some basic information about the amount of execution time a function consumes and general information about how much of that time is spent on behalf of the function as well as the cumulative amount of time the function spends on behalf of its callers. Because of the nature of the time-sampling technique, the time values are different on each consecutive run and are affected by other running programs.

The level of detail provided in the profiler's detail report may be adequate for simple applications, but it doesn't contain enough detailed parent/child information to help you diagnose performance problems in more complex applications. For example, it shows only the cumulative amount of time consumed by all child functions instead of showing the detailed time consumed by each. This makes it difficult, for instance, to determine which of ten child functions may be performing poorly. This problem is further complicated by the fact that Visual C++'s profiler profiles only your current application's code. So if one of those child functions is contained in a DLL, you won't get detailed information about it.

The Visual C++ profiler might suit your needs for fairly simple applications where you aren't dealing with a complex calling sequence of nested function calls or external

components. It does have the advantage of being tightly integrated with the Visual C++ IDE and the additional advantage that it is already included with the Visual C++ development package.

Microsoft Visual C++ 5.0 Professional Edition. List price: \$249. Microsoft Corp., Redmond, WA; 800-426-9400, 206-882-8080; www.microsoft.com. Circle 480 on reader service card.

TracePoint Technology Inc.

HiProf



HiProf 1.01 is the first of a family of products from TracePoint Technology, recently spun off from Digital Equipment Corp. HiProf uses a technology that the company refers to as Binary Code Instrumentation, a form of the binary instrumentation profiling technique described earlier in this article. HiProf analyzes the code and symbols in your program's executable and generates a new instrumented executable, which it runs to produce real-time analysis reports and graphs.

To set up an application for profiling, all you need to do is build it with debugging information. Run the HiProf IDE and create a new project that points to your program's executable. Then choose *Instrument & Run* from the *Application* menu. HiProf will instrument and run your program's executable and produce real-time performance reports (see Figure 2). The instrumentation process can take up to several minutes for medium-size to large applications, depending on your processor and available memory.

When you exit your instrumented applica-

tion, HiProf generates its performance monitoring reports and produces a snapshot of your application's performance along with a detailed list of each of its threads. When you choose a thread from HiProf's Thread List, the profiler displays Function List and Hierarchical View windows. The Function List window shows the total time consumed by each function in your application, including and excluding calls to child functions. Other items displayed are the number of times a function is called and the name of the source file containing it.

HiProf's Source View window works in conjunction with the Function List, providing the ability to select a function and see detailed timing information for each line of source code. The Source View window contains five columns listing the line number, the percentage and amount of time the function consumes on behalf of its own code, the number of times it is called, and the source code statement for each line. These five columns are presented for each line of code in the function. Using them, it's possible to see the performance information for every line of code in the function.

HiProf's Hierarchical View window displays a graphical representation of a function's performance in the context of its parent/child relationship. When you choose a function in the function list, the Hierarchical View displays detailed information about each function that calls it (its parents) and each function called it calls (its children). The level of information provided is useful for tracking down performance bottlenecks that involve several nested levels of child function calls.

HiProf also offers several configuration options to allow you to choose the areas of your application that you wish to include or exclude from profiling. You can also profile selected external components linked to your application. An advanced feature allows you

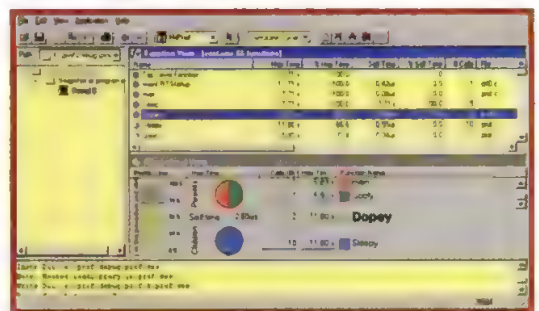


FIGURE 2: TracePoint's HiProf, with Function View and Hierarchical View windows.

to step interactively through your application and take performance snapshots at various points of execution.

HiProf is a solid product that is straight-

It's cutting edge...

It's interactive...

It's PC Magazine CD...

**and every PC Magazine reader
should have it!**



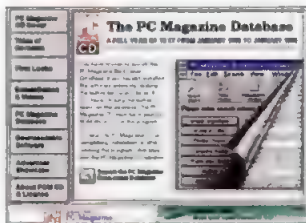
Now there's an interactive companion to *PC Magazine* that gives you information you can't get through print alone. Using advanced multimedia technology, it lets you actually sample programs and products...see screens...

examine printout...hear playback... and listen in as the gurus of the industry discuss new technology.

It's **PC Magazine CD**, and it is guaranteed to help you know more, and do more, with new PC products and technologies.

You get the complete text of the past year's issues of PC Magazine

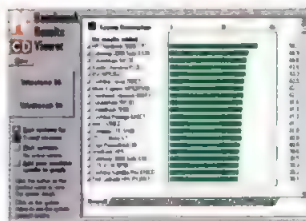
Want to check out past reviews? Catch up on a topic you missed? *PC Magazine CD* gives you a searchable reference library of the past 12 months of *PC Magazine* with every quarterly release. With the hit of a key, the click of a screen, all the valuable buying advice and productivity help from *PC Magazine* will appear on your desktop.



Subscribe to *PC Magazine CD*, and by the end of one year you'll have two years' worth of back issues on disc — \$173.80 worth of *PC Magazine* — yours to access instantly. And they won't take up so much as one inch on your bookshelf!

Put your system to the test — with PC Magazine's Benchmark Tests!

Are you running at top speed? Is it time to upgrade? Now you can rate your own equipment with many of the same WinBench and Winstone tests our experts use. Every *PC Magazine CD* lets you access many of the best benchmark tests — without waiting for a trade show release, without the tedious downloads.



Get 4 Quarterly Releases For \$49.95 — And Save 30%!
Call 1-800-335-1195

Get the edge in product purchasing and productivity! Guaranteed!

In past releases we've let you see and hear samples of the top 100 CDs, watch full-motion videos of the fastest Pentium dynamos, given you trial versions of new Windows software to try before you buy...and linked you straight to the coolest sites on the Net.



PC Magazine CD — it's the perfect addition to your knowledge base. Get it and you'll know more. You'll do more. You'll buy smarter. Or we'll give you your money back. Guaranteed!

Act now to save 30%!

Sign on for *PC Magazine CD* with this ad and you'll get 4 quarterly releases for \$49.95 — 30% off the price you'd pay if you bought them one-by-one. That's like getting nearly two of the discs free — and that's a great deal on a product that brings you the sight and sound of the products, programs and people you want to get to know.

Call 1-800-335-1195 now and mention priority code: 5Z7K

Use your Mastercard, Visa or American Express card and mention the priority code to start your one-year (4-release) subscription at this insider price! Or, visit our special order page at <http://subscribe.pcmagcd.com/deals>. Do it now.



Toll-free number is available in the U.S. and Canada. Other countries, call 303-665-8930, or fax your order to 303-604-7455.



PC MAGAZINE CD • P.O. Box 59494 • Boulder, CO 80322-9494 • <http://www.pcmagcd.com>

SYSTEM REQUIREMENTS: 486 or higher PC-compatible system, Windows® 3.1, 8MB RAM, double-speed CD-ROM drive. VGA monitor (256-color display recommended). Windows-compatible soundcard recommended for some functions. Please allow 60 days for delivery. Send payment in U.S. funds only. PC Magazine CD is \$72 in Canada; \$99 for all other foreign orders (includes airmail charges).

forward to use. The Hierarchical View contains information helpful in tracking performance problems in complex applications with many levels of child function calls. The Source View window is useful for analyzing a poorly performing function on a line-by-line basis. HiProf also offers some limited integration with the Visual C++ IDE, although it's not much more than a few toolbar buttons.

HiProf 1.01. List price: Single user, \$249; 10-pack, \$2,290; one-year maintenance, e-mail support, and updates, \$99. TracePoint Technology Inc., San Jose, CA; 408-283-5350; fax, 408-283-5353; www.tracepoint.com. Circle 481 on reader service card.

Pure Atria Corp.

Visual Quantify

Visual Quantify, from Pure Atria Corp., is an advanced tool that profiles C++ programs using what Pure Atria refers to as Object Code Insertion, basically a form of the binary instrumentation technique described previously. We looked at Version Beta 2, which also profiles Java applications using a real-time monitoring interface that times execution of each byte code with Microsoft's Java Virtual Machine. Visual Quantify supports profiling of external components, such as ActiveX controls and DLLs.

To begin profiling, you choose *File | Run in*

Visual Quantify's IDE and select the executable program you would like to profile. Visual Quantify then loads the executable program and produces an instrumented version of it. As was the case with HiProf, Visual Quantify's instrumentation process can be time-consuming. When the process is complete, your application automatically begins execution.

Visual Quantify displays your performance information in its main window when you exit your application. The Run Summary window—the central part of the detail display—contains detailed information about each thread in your application, your operating system, and the hardware that was used to perform the test. It also provides a log listing which modules were instrumented and what instrumentation process was used.

Visual Quantify's detail display also includes the Call Graph window (see Figure 3), which shows a graphical representation of the execution flow of your application. The graph highlights the longest execution path in your program, so you can easily spot potential code bottlenecks from a high-level view. The Call Graph window allows you to configure its display in many different ways. One option, for instance, allows you to view the ten most time-consuming functions.

The Function List window displays detailed information about each function, including the

number of times the function is called, the time consumed by the function excluding child function calls, and the time consumed by the function including child function calls.

You can also click on a particular function in the Call Graph window to display its Function Detail window. A Function Detail window consists of three sections, the first

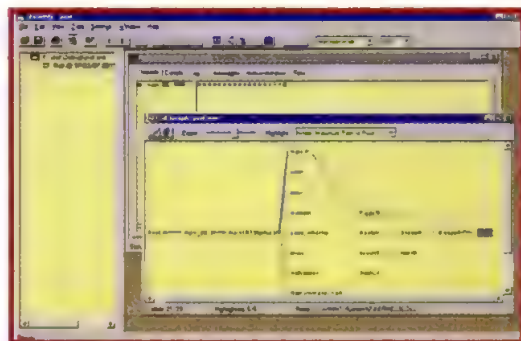


FIGURE 3: Pure Atria's Quantify, with Run Summary and Call Graph windows.

containing the same information as the Function List window, and the second and third containing lists of the selected function's parent and child functions, respectively. You can select from these lists to navigate forward or backward through the execution path of your application. The level of detail provided in the Function Detail window is generally adequate for pinpointing poorly performing child functions, although using it for navigation is awkward.

The PowerTune feature allows you to perform advanced configuration, such as selecting the functions to be profiled and choosing whether profiling information is collected for each line of source code or each function, or at certain time intervals. By default Visual Quantify collects performance data for entire applications, including components. Using PowerTune, you can narrow the scope of Visual Quantify's profiling to focus on problem areas in your application. Not only does that reduce the amount of report information produced, it also lessens the time needed to generate instrumentation.

In spite of its advanced features, Visual Quantify does have one limitation: It is the only tool reviewed here that doesn't support Windows 95. Although many corporate Windows developers may be using Windows NT for development, the lack of Windows 95 support means you won't be able to spot performance bottlenecks that might manifest themselves only under Windows 95.

Visual Quantify's Call Graph display lets you immediately see the relationship between all of your functions as well as the longest execution time line. However, its detailed func-

Java Profiling

Since Java is in its infancy, it's only natural to assume that associated tools would be as well. The assumption appears to be valid. Of the tools in this roundup, only Visual Quantify provides profiling for Java applications, and that only on Windows NT and only with a beta version of Microsoft's Java Virtual Machine. (Intel advertises Java profiling with VTune 2.4, but that support isn't available as of this writing.) Based on descriptions of the technology used, however, we can get an idea of how such tools go about profiling a Java application.

A Java compiler generates *byte codes* by analyzing your Java application's source code. Byte codes are tokens that indicate the operation to be performed. Byte codes are generic, machine-independent values that indicate very simple operations. They require translation to the processor's native machine-language instructions before they

can be executed. The translation is the job of the Java Virtual Machine (JVM). JVMs are provided for many different operating systems and processors.

It is the JVM that contains the execution information necessary for profiling. To profile a Java application, the profiler must be able to collect timing information about the machine's currently executing byte codes. Pure Atria has been working in conjunction with Microsoft to develop a new version of Microsoft's JVM for Win32. The new JVM provides interfaces that Visual Quantify can use to determine the currently executing instruction, in order to build performance reports that indicate the time consumed for each function in a Java application. Although Intel didn't provide information about how VTune will profile Java applications, it seems logical that VTune will take an approach similar to Visual Quantify's.

tion screen doesn't provide the same level of hierarchical calling information as HiProf's. Navigating through the call graph and function detail screens is awkward. If you are a Windows 95 developer, then Visual Quantify probably isn't for you.

Visual Quantify. List price: \$550; one-year subscription (includes upgrades and support), \$748; subscription bundle with Purify, \$1,198. Pure Atria Corp., Cupertino, CA; 408-863-9900; fax, 408-863-4120; www.pureatria.com. Circle 482 on reader service card.

Intel Corp.

VTune

VTune, from Intel Corp., is billed as a complete "visual tuning environment" for Windows developers. It uses a combination of binary instrumentation and time sampling to monitor the performance of many aspects of your application and the Windows operating environment, including device drivers and system DLLs. The release Version 2.4 will also include support for profiling Java applications (though that feature isn't available in the preview version we review here).

Setting up your project for VTune is much the same as with the other profiling tools. Start by building a debug version of your executable and then loading the VTune IDE. A wizard sheet will then appear prompting you to create a project or load an existing one. If you choose to create a project, you are prompted for the name of the executable as well as other optional information.

Once you've created a project, you begin profiling by choosing **Start Monitor Session** from the **Run** menu. VTune displays a cue-

Modules Report window, which shows detailed CPU statistics, including CPU time consumed for your application and for operating system components. You can select an individual component in the Modules Report window and zoom into a greater level of detail.

VTune's Code Analysis option displays a list of your application's functions and allows you to view specific timing information related to each. The detailed analysis screen displays timing information for each line of source code and also allows you to view the corresponding assembly language statements. In this mode, the program displays processor-specific information about each assembly language instruction, such as the number of clock cycles required.

VTune also offers a Code Coach feature that works in conjunction with Code Analysis. The Code Coach analyzes the code patterns in functions you select and suggests ways you can improve performance.

VTune's user interface exhibited some annoying behavior during testing, stemming more from than from implementation. The UI consists of a main control window that opens top-level windows for each operation (similar to the UI in Visual Basic, prior to Version 5.0). In some cases, such as zooming in on a report detail, VTune creates a new top-level window for each zoomed view. So if you zoom four times, you end up with four windows (with corresponding Taskbar entries). It took only a small amount of effort to clutter the Windows desktop and Taskbar with VTune's windows.

VTune is an industrial-strength product that offers many advanced features, but at the price of a steep learning curve. It appears to be well

suited for getting the best performance from your Intel processor and certainly has a place if you're developing intensive real-time applications or sophisticated device drivers. Because of its complexity, it wouldn't necessarily be a good tool for typical application developers. If you decide to use it, you should expect to spend some time with the documentation to determine how to take advantage of some of its more advanced features.

VTune 2.4. List price: \$279. Intel Corp., Santa Clara, CA. 800-628-8686, 408-765-8080; www.intel.com. Circle 483 on reader service card. **PC**

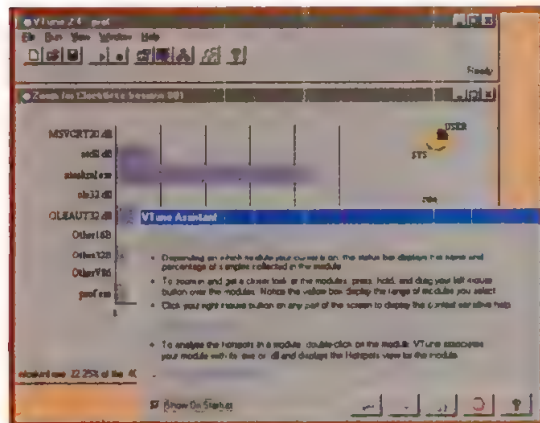


FIGURE 4: Intel's VTune, with the Module Report window and the VTune Assistant.

card-like help window (VTune Assistant) that is always available to guide you through each step of the process (see Figure 4). When the profiling session is complete, VTune displays a

Steven E. Sipe is a developer based in Wilmington, North Carolina, and the author of the recently published PC Magazine utility ZDDesk.

Bookmark these



<http://www.zdnet.com>
ZD Net Home Page

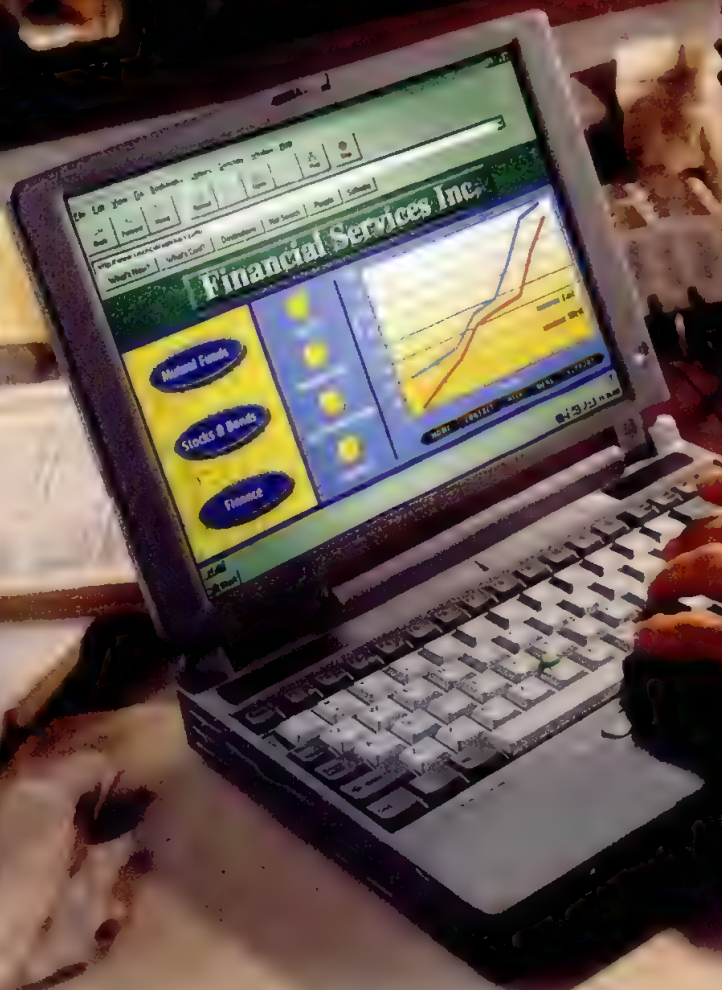


<http://www.pcmag.com>
PC Magazine Site

**Come see the
hottest destinations
for computer buying
information on the
World Wide Web.**

ZDNet™
World Wide Web
Edition

After leading the industry year after year,
what is it we're trying to prove?



We mean business.

Introducing the new Toshiba Tecra.
The ultimate portable for corporate America.

If there's one thing we know how to do well, it's raising portable industry standards to new levels. Something we couldn't do without the constant challenge of not only meeting your needs, but surpassing them. Introducing the Tecra™ 530CDT. A portable packed with the perfect balance of performance, portability and expandability. Delivering a high-resolution TFT display, large storage capacity and a 166MHz Intel Pentium® processor with MMX™ technology. All wrapped up in a sleek new design. The Tecra 530CDT. Experience the portable that will take the business world into the next millennium. When you do, you'll find yourself in a place where staying ahead of the game is a way of life. With one clear intention. **Always Lead.™**

Tecra 530CDT/520CDT

- 12.1" dia. active-matrix TFT color display
- 1024 x 768 resolution (530CDT)
- 800 x 600 resolution (520CDT)
- 166MHz Pentium® processor with MMX™ technology
- 256KB L2 cache
- PCI system-bus architecture
- 2.1 billion byte (≈2.0GB) removable HDD
- 32MB high-speed EDO DRAM (expandable to 160MB)
- SelectBay™ supports CD-ROM, floppy disk drive, optional second hard drive or optional second Lithium Ion battery
- Modular 10X* CD-ROM
- HiQV™ PCI graphics controller with 2MB video memory (4Mbit EDO RAM)
- Universal Serial Bus (USB) port
- MPEG playback through either software or optional ZV Card
- 16-bit MIDI, WAV and Sound Blaster® Pro compatible with stereo speakers and microphone
- Supports two Type II or one Type III 16-bit PC Cards, ZV Cards or 32-bit CardBus Cards
- Built-in cellular-ready 33.6Kbps V.34 voice/data/fax modem
- Fast Infrared (FIR) IrDA compliant port
- Lithium Ion battery
- Optional Desk Station V Plus docking station or NoteDock™ II Enhanced Port Replicator
- Windows® 95
- 3-year limited warranty
- Toll-free technical support - 7 days a week, 24 hours a day

For more information, visit <http://computers.toshiba.com>, or call 1-800-457-7777.



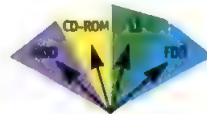
NEW DESIGN

New tooling to deliver high-end features in a durable, sleeker notebook.



ULTIMATE PERFORMANCE

Experience accelerated multimedia applications with MMX™ technology, 32-bit PCI architecture and 32MB of memory, standard.



CUSTOMIZED CONFIGURATION

With the SelectBay™ configure your system to meet your needs. Swap out your 10X* CD-ROM with a floppy disk drive, optional second 2GB hard drive or optional second Lithium Ion battery.



EXPANDABILITY

With our one-touch hot docking solution, you get additional slots for PC Cards, PCI and ISA Cards and stereo speakers.

In Touch with Tomorrow
TOSHIBA

CIRCLE 377 ON READER SERVICE CARD

Corel® WordPerfect® Suite 8

is the Only Office Suite

that Delivers Support for

MMX™ Technology†



Support for MMX™ Technology†—accelerates slide transitions and drawing on computers with Intel Pentium® processors

Transition Effects—choose from 120 effects to add excitement to your presentations

Navigation Tabs—keep your bearings and move around quickly within your slide show

Import bitmap images directly into your chart

Edit bitmaps within Corel Presentations 8 to create desired special effects

Internet Publisher—publish your slide show to the Web with ease

For graphically charged presentations that will electrify your audience, take advantage of Corel® Presentations™ 8—a powerful part of Corel® WordPerfect® Suite 8, the most innovative office software on the market. With all the great tools you've come to expect from your presentation software, plus features you won't find anywhere else, Corel Presentations 8 delivers showstopping results every time.

Presentation Features	Corel Presentations 8	Microsoft PowerPoint 7
Support for MMX™ technology	✓	no
Publish to Java™ (Corel Barista™)	✓	no
QuickKeys™ keystroke actions (such as go to another slide, launch an application, play a sound, or even link to a URL)	✓	no
Add multiple slides simultaneously	✓	no
Import outlines into org. charts	✓	no
Customizable background gallery	✓	no
Slide navigation tabs	✓	no
Chart styles	✓	no
Range Highlighter used in datasheet	✓	no
Sort pie slices	✓	no
Separate drawing mode	✓	no
QuickWarp™ objects	✓	no
Blend objects together	✓	no
Place/Resize/Rotate chart	✓	no (must separate into objects)
Gradient fill (text and objects)	✓	objects only
Quick 3D any image	✓	drawing objects only
Slide transitions	120	41
Data chart functions (equations)	16	7

Corel® WordPerfect® Suite 8

Office Suite Excellence



COMPUSA
THE COMPUTER SUPERSTORE
1-800-COMPUSA

OfficeMax
Taking Your Savings To The Max!
1-800-788-8080

\$149.99*
Competitive upgrade
CD-ROM version



COREL
www.corel.com
Call now for faxed literature!
1-613-728-0826 ext. 3080
Document # 1383

†Intel Pentium processor not required to run Corel WordPerfect Suite 8, only necessary for users who want to take advantage of the suite's support for MMX technology.
*For upgrade version only: US\$ plus applicable taxes and shipping. Dealer may sell for less. Prices may vary from store to store.
Copyright © 1997 Corel Corporation. All rights reserved. Corel, WordPerfect, Quattro, Presentations, CorelCENTRAL, QuickWarp, QuickKeys and the Corel balloon logo are trademarks or registered trademarks of Corel Corporation or Corel Corporation Limited. Microsoft and PowerPoint are registered trademarks of Microsoft Corporation. MMX, the MMX logo and Pentium are trademarks or registered trademarks of Intel Corporation. Java is a trademark of Sun Microsystems, Inc. All other product, font and company names are trademarks or registered trademarks of their respective companies.

CIRCLE 207 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

A RAM Primer

From BEDO to WRAM, we give you a handle on the many types of memory available today.

By Neil Randall

Once upon a time, magazine ads for computers were actually readable. Not only were there fewer processors to choose from, there were also fewer choices in everything else, from hard disks to sound cards. Today, the choices boggle the mind. Acronyms run rampant. And as if it weren't bad enough having to deal with all the other jargon, we now have to confront a seemingly limitless variety of memory types. It used to be enough to have RAM, but now RAM always seems to have one or more extra letters in front of it. DRAM, VRAM, SRAM, SDRAM, WRAM—it's enough to confuse even the staunchest technology watcher.

In this article we hope to ease some of the confusion by presenting a description of the various types of RAM. We don't have the space to cover them all, but you'll find the most frequently encountered RAM varieties in the glossary below.

The first order of business, however, is a short explanation of how RAM works, as well as the relationship between RAM and the CPU (central processing unit, or processor). The CPU—yours is probably an Intel 486 or Pentium type—is the heart of the computer, where data is processed and program instructions are interpreted. Integrated with the CPU is the system's main memory, called *random-access memory* or *RAM*. Together, these two components make up the core of your machine; components such as hard disks, controllers, and video cards are peripheral to this central activity, and are therefore known as *peripherals*.

The CPU uses its RAM as a storage area for data, calculation results, and program instructions, drawing on this storage as necessary to perform the tasks required by programs. In order to store data and draw from the data store, the CPU specifies the memory *address* of the required information. The *address bus* allows the CPU to send the address to RAM, and the *data bus* allows the actual data transfer to the CPU. The term *bus* itself refers to the connection between the two devices that

allows them to communicate. An important measurement of RAM performance is *access time*, the amount of time that passes between the instant the CPU issues an instruction to RAM to read a particular piece of data from a particular address and the moment the CPU actually receives the data. Today's RAM chips typically have a 60-ns access time, which means it takes 60 nanoseconds (a *nanosecond* is a billionth of a second) to perform this round-trip function. This access time is much faster than that of the 100- to 120-ns chips of a few years ago, but it's still much slower than the ideal access time of zero, which would be realizable if the CPU itself stored all the data. To speed things further, the CPU has



access to *cache memory* (usually referred to as "the cache"). At 20 ns or better, cache memory is faster than main memory, but systems contain less of it than main memory (cache memory is expensive), and therefore only select data—the data the CPU will probably need next—is placed inside it. The selection is handled by the cache controller.

Memory chips function by storing electronic charges. The chips are made up of a capacitor and a transistor, with the capacitor storing the charge and the transistor turning the charge on or off. With RAM chips, the system can alter the on or off state of the charges, but with ROM (read-only memory) chips the charges are either permanently on or permanently off. This article deals only with RAM.

RAM (*random-access memory*). This is the umbrella term for all memory that can be read from or written to in a nonlinear fashion.

However, it has come to refer specifically to chip-based memory, since all chip-based memory is random-access. It is not the opposite of ROM. The computer can read ROM; it can read *and* write to RAM.

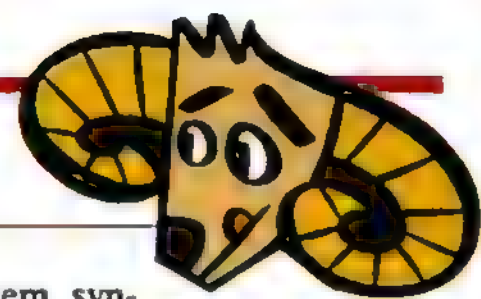
SIMM (*single in-line memory module*). **DIMM** (*dual in-line memory module*). SIMM and DIMM refer not to memory types, but to modules (circuit boards plus chips) in which RAM is packaged. SIMMs, the older of the two, offer a data path of 32 bits. Because Pentiums are designed to handle a much wider data path than that, SIMMs must be used in pairs on Pentium motherboards (they can be used singly on boards based on 486 or slower processors). DIMMs, which are of more recent origin, offer a 64-bit path, which makes them more suitable for use with the Pentium and other more recent processors. From a buyer's standpoint, the good news is that one DIMM will handle the work of two SIMMs and thus can be used singly on a Pentium motherboard. DIMMs are more economical in the long run, because you can add one at a time to your system.

DRAM (*dynamic RAM*). Dynamic RAM is the standard main memory type in computers today and is what you're referring to when you tell someone your PC has 32MB of RAM.

In DRAM, information is stored as a series of charges in a capacitor. Within a millisecond of being electronically charged, the capacitor discharges and needs to be refreshed to retain its values. This constant refreshing is the reason for the use of the term *dynamic*.

FPM RAM (*fast page-mode RAM*). Until the advent of EDO RAM (see below), all main memory found in PCs was of the fast page-mode variety. That's why the name wasn't well known: There was no need to state the type, since there was only one. The access times of FPM RAM dropped as the technology matured, from 120 ns (nanoseconds) down to the now-common access time of 60 ns. The Pentium processor, however, allows for a bus speed of 66 MHz, which is faster than FPM RAM can keep up with. The speed of a 60-ns RAM module performing random page access (where *page* refers to a region of address space) is below 30 MHz—far slower than the bus speed. So DRAM makers came up with the concept of the *RAM cache*.

EDO RAM (*extended-data-out RAM*). Despite the hype surrounding it, EDO RAM is no more than another type of FPM RAM. Essentially, it recognizes that most of the time when the CPU requests memory for a particular address, it's going to want some more addresses



nearby. Instead of forcing each memory access to start afresh, EDO RAM hangs onto the location of the previous access, thereby speeding access to nearby addresses. EDO RAM speeds up the memory cycle, with improvements in memory performance of as much as 40 percent. But EDO RAM is effective only up to a bus speed of 66 MHz, and that's quickly being bypassed by the most recent crop of AMD, Cyrix, and Intel processors.

BEDO RAM (burst extended-data-out RAM). As the need for faster access to DRAM has increased, technologies have been developed to provide it. One such technology is known as *bursting*, in which large blocks of data are sent and processed in the form of an uninterrupted "burst" of smaller units. What this means to DRAM is that the burst carries details not only about the address of the first page, but also of the next few. BEDO RAM can handle four data elements in one burst, and this allows the final three elements to avoid experiencing the delays of the first—all the addresses are ready to be processed. The DRAM is given the first address, and then can process the rest at a rate of 10 ns each. BEDO RAM, however, despite its substantial speed increase, still has difficulty moving past the 66-MHz bus barrier. BEDO RAM exists because SDRAM manufacturers were uninterested in pricing SDRAM to be competitive with EDO RAM; as a result, more work was done with EDO to add bursting technologies for speed rivaling that of SDRAM. Hence BEDO RAM.

SDRAM (synchronous dynamic RAM). Resources galore are being poured into SDRAM development, and it has begun making its appearance in the PC ads. The reason for its increasing popularity is twofold. First, SDRAM can handle bus speeds of up to 100 MHz, and these are fast approaching. Second, SDRAM is synchronized with the system clock itself, a technical feat that has eluded PC engineers until now. SDRAM technology allows two pages of memory to be opened simultaneously. A new standard for SDRAM is being developed by the SCiZZL Association at Santa Clara University (California) along with many industry leaders. Called SLDRAM, this technology improves on SDRAM by offering a higher bus speed and by using packets (small packs of data) to take care of address requests, timing, and commands to the DRAM. The result is less reliance on improvements in DRAM chip design, and ideally a lower-cost solution for high-performance memory. Watch for SLDRAM in the near future.

SRAM (static random-access memory). The difference between SRAM and DRAM is that where DRAM must be refreshed constantly, SRAM stores data without an automatic refresh.

The only time a refresh occurs, in fact, is when a write command is performed. If the write command doesn't occur, nothing in the SRAM changes, which is why it's called *static*. The benefit of SRAM is that it's much faster than DRAM, reaching speeds of 12 ns as compared with BEDO's 50 ns. The disadvantage is that SRAM is much more expensive than DRAM. SRAM's most common use in PCs is in the second-level cache, also called the *L2 cache*.

L2 cache. Caching is the art of predicting what data will be requested next and having that data already in hand, thus speeding execution. When your CPU makes a data request, the data can be found in one of four places: the L1 cache, the L2 cache, main memory, or in a physical storage system (such as a hard disk). L1 cache exists on the CPU, and is much smaller than the other three. The L2 cache (*second-level cache*) is a separate memory area, and is configured with SRAM. Main memory is much larger and consists of DRAM, and the physical storage system is much larger again but is also much, much slower than the other storage areas. The data search begins in the L1 cache, then moves out to the L2 cache, then to DRAM, and then to physical storage. Each level consists of progressively slower components. The function of the L2 cache is to stand between DRAM and the CPU, offering faster access than DRAM but requiring sophisticated prediction technology to make it useful. The term *cache hit* refers to a successful location of data in L2, not L1. The purpose of a cache system is to bring the speed of accessing memory as close as possible to the speed of the CPU itself.

Async SRAM (asynchronous SRAM). Async SRAM has been with us since the days of the 386, and is still in place in the L2 cache of many PCs. It's called *asynchronous* because it's not in sync with the system clock, and therefore the CPU must wait for data requested from the L2 cache. The wait isn't as long as it is with DRAM, but it's still a wait.

Sync SRAM (synchronous burst SRAM). Like SDRAM, Sync SRAM is synchronized with the system clock, so it's faster than the Async SRAM commonly used for L2 caches, with speeds of about 8.5 ns. Unfortunately, Sync SRAM isn't being produced in sufficient quantities to drive its cost down, so it seems destined for a relatively short life. That's especially true because it loses the ability to synchronize at bus speeds higher than 66 MHz. For the new breed of machines, therefore, let's welcome...

PB SRAM (pipeline burst SRAM). Using burst technology, SRAM requests can be *pipelined*, or collected so that requests within the burst are executed on a nearly instantaneous basis. PB SRAM uses pipelining, and while it's slight-

ly behind system synchronization speeds, it's a possible improvement over Sync SRAM because it's designed to work well with bus speeds of 75 MHz and higher. Look for PB SRAM to be a major player in Pentium II systems and beyond.

VRAM (video RAM). VRAM is aimed precisely at video performance, and you'll find it primarily on video accelerator cards or on motherboards that incorporate video technology. VRAM is used to store the pixel values of a graphical display, and the board's controller reads continuously from this memory to refresh the display. Its purpose is not only to give you faster video performance than you'd get with a standard video board, but to reduce strain on the CPU. VRAM is *dual-ported* memory; there are two access ports to the memory cells, with one used to constantly refresh the display and the other used to change the data that will be displayed. Two ports means a doubling of bandwidth, and faster video performance as a result. By comparison, DRAM and SRAM have only one access port.

WRAM (Windows RAM). Like VRAM, WRAM is a dual-ported type of RAM and it is used exclusively for graphics performance. WRAM is similar to VRAM in its operation, but it offers a higher overall bandwidth (roughly 25 percent higher), in addition to several graphics features that applications developers can exploit. These include a double-buffering data system several times faster than VRAM's buffer, resulting in considerably faster screen refresh rates.

SGRAM (synchronous graphics RAM). Unlike VRAM and WRAM, and despite the fact that its primary use is on video accelerator cards, SGRAM is a single-ported RAM type. It speeds performance through a dual-bank feature, in which two memory pages can be opened simultaneously; it therefore approximates dual-ported. SGRAM is proving to be a significant player in 3-D video technology because of a block-write feature that speeds up screen fills and allows fast memory clearing. Three-dimensional video requires extremely fast clearing, in the range of 30 to 40 times per second.

CONCLUSION

All RAM technologies emphasize speed and attempt to offer more of it without an increase in cost. But CPU technology keeps getting faster, and memory technology must keep pace—hence the need for different types of RAM. It may be confusing, but rest assured, it's in our best interests. **PC**

Neil Randall is a frequent contributor to PC Magazine.

It makes
everyone's work
that much better.



X You do your best work when you're having fun. No wonder so many amazing things come out of the new Document HomeCentre™ from Xerox®.



*Color print, copy and scan
your way to a creative nirvana*



The perfect partner for your PC, it

encourages the entire family to create group projects or their own individual masterpieces. Print out eye-catching newsletters you design with drag-and-



DOCUMENT HomeCentre™

Xerox Brings the Power of Creativity Home

drop simplicity. Copy your sales pieces for a little down-home mass marketing. Scan the twist-
ing brilliance of Van Gogh into a brilliant

\$499*

school report. Capture the beauty of the world around you. Make it your own. The fee for this creative

*Our detachable scanner
tree's your imagination.*



license? Less than you'd think. You'll find the multi-talented HomeCentre value-priced at CompUSA and Staples. For more information, call 1-800-TEAM-XRX. Or surf the Web over to www.xerox.com/products.html. Rediscover what you've known in your heart all along. Fun works.

THE DOCUMENT COMPANY

XEROX

OLD BOY'S NETWORK?

NOT LIKE YOU'D THINK.

But if you want to hang with the tech elite and make career-boosting connections, there's no place like the new Computing Pro™ from CSI (CompuServe). That's because it's the first and only cybersite where you can get down to business with the industry's movers and shakers—and it's only on CSI.

For starters, on **Computing Pro** you can:

- **Uncover golden business opportunities** and venture capital projects—even post or pull online résumés, RFPs, and job listings.
- **Interact with others in your profession** with dedicated areas for Network, Software, and Channel Marketing professionals.
- **Breeze through daily news** summaries and editorial insight from Ziff-Davis editors on ZDNet, including free access to ZDNet University.
- **Update your system—and yourself.** You'll have unlimited access to CyberMedia's Oil Change software (a \$39.95 value), plus an archive of over 200 industry publications with Computer Database Plus.

And because Computing Pro is on CSI, you'll be able to access our thousands of other services, plus the Internet, whenever you want.

Make sure you're as well connected professionally as you are technically—call us now for 10 FREE* hours of CSI and exclusive access to Computing Pro.

Call now for **Computing Pro** on CSI

1-800-450-4554

and get your FREE CSI software.



COMPUERVE.

©1997 CompuServe Incorporated. All rights reserved. CompuServe, CSI, and Forum are registered trademarks, and Computing Pro and the CSI logo are service marks of CompuServe Incorporated. All other trademarks referenced are the property of their respective owners.

*Free online service up for use subject to the terms, conditions, and operating rules presented at sign-up and available online.

Building Automation Hierarchies with MFC, Part 2

Adding the methods and properties to make our sample application an Automation server.

By Jeff Prosise

In the previous column, we began building an Automation server named Pie. Our sample application offers charting services to Visual Basic/Visual Basic for Applications programs and other Automation clients. Pie is no ordinary MFC (Microsoft Foundation Classes) Automation server; rather than settling for the flat, document-based object model found in many Automation servers written with Visual C++, Pie implements a two-tiered object model patterned after ones featured in Excel, Internet Explorer, and other Microsoft Automation servers.

At the conclusion of Part 1 (which appeared in the issue of October 7, 1997), Pie was a fully functional standalone application, but as yet it contained no Automation properties or methods. Let's pick up where we left off by turning Pie into a hierarchical Automation server. We'll begin by creating C++ classes to represent the chart, window, and toolbar. Then we'll wire the new classes into our application and hook them up to the document class to assemble an Automation hierarchy.

ADDING AUTOMATABLE CLASSES

The first step in phase 2 of Pie's evolution is to use ClassWizard to add three automatable classes, one for each of the subobjects in the hierarchy's second tier. We'll name the classes CAutoChart, CAutoWindow, and CAutoToolBar. Later, once we've added Automation properties and methods to the classes, we'll connect them to the document class, which already includes Automation support (thanks to AppWizard) and which serves as a proxy for the Application object. (The first part of this article has a diagram of Pie's Automation hierarchy.)

To create the automatable classes, follow these steps:

1. Invoke ClassWizard, click on the **Add Class** button, select **New** from the drop-down menu, and fill in the New Class dialog as shown in Figure 1 to create the class CAutoChart. Note that the base class is CCmdTarget, which is where the heart of MFC's Automation server support lives. Before you click **OK**, be sure the Automation button is selected so that CAutoChart can support Automation properties and methods.
2. Repeat step 1 to derive an automatable class named CAutoWindow from CCmdTarget.
3. Repeat step 1 again to derive an automatable class named CAutoToolBar from CCmdTarget.

The new classes are now part of the application, but we need to round them out by adding properties and methods. Let's start

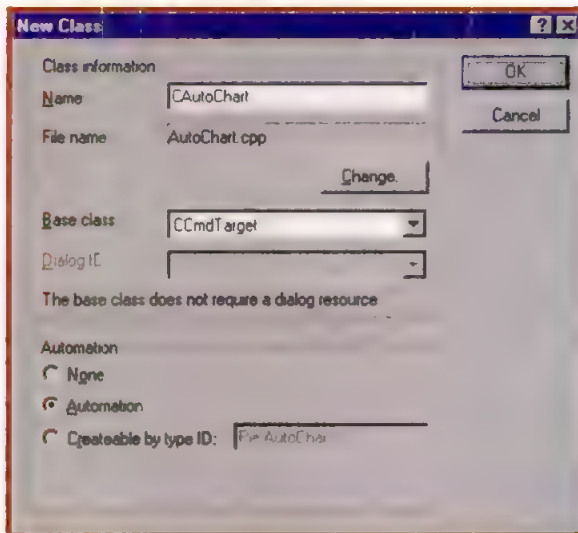


FIGURE 1: Microsoft Visual C++'s ClassWizard lets you create automatable classes, starting with this New Class dialog.

simple by adding a **BOOL** Get/Set Automation property named **Visible** to CAutoToolBar. A VB/VBA programmer can use this property to turn the toolbar on and off. To add the property, invoke ClassWizard, go to the Automation page, and make sure CAutoToolBar is showing in the **Class name** box. Then click on the **Add Property** button, fill in the Add Property dialog as shown in Figure 2, and click **OK**. Finish by clicking on ClassWizard's **Edit Code**

button and typing in the following code:

```
BOOL CAutoToolBar::GetVisible()
{
    CMainFrame* pFrame = (CMainFrame*)
    AfxGetMainWnd ();
    return (pFrame->m_wndToolBar
    .GetStyle () & WS_VISIBLE) ?
    TRUE : FALSE;
}

void CAutoToolBar::SetVisible
(BOOL bNewValue)
{
    CMainFrame* pFrame = (CMainFrame*)
    AfxGetMainWnd ();
    pFrame->ShowControlBar (&pFrame
    ->m_wndToolBar, bNewValue, FALSE);
}
```

to implement CAutoToolBar's GetVisible and SetVisible functions.

Before the code we just added to CAutoToolBar will compile, we must do two things:

1. Add an **#include** statement for **MainFrm.h** to CAutoToolBar's .cpp file.
2. Edit **MainFrm.h** and make **m_wndToolBar** a public member variable (it's protected by default).

Now use your ClassWizard skills to add Automation properties and methods to the other automatable classes. Here's the procedure to follow:

1. Add a **BOOL** Get/Set property named **Visible** and a void method named **Refresh** to the class CAutoWindow. Here is the finished code for the CAutoWindow member functions that ClassWizard creates:

```
BOOL CAutoWindow::GetVisible()
{
    return AfxGetMainWnd ()
    ->IsWindowVisible ();
}

void CAutoWindow::SetVisible
(BOOL bNewValue)
{
    AfxGetMainWnd ()->ShowWindow
    (bNewValue ? SW_SHOW : SW_HIDE);
}

void CAutoWindow::Refresh()
{
    CFrameWnd* pFrame = (CFrameWnd*)
    AfxGetMainWnd ();
    pFrame->GetActiveView ()
    ->Invalidate ();
}
```

2. Add an **int** Get/Set property named

QRev to the class CAutoChart. Make QRev an indexed property by adding a short named nQuarter to the property's parameter list (see Figure 3). Then modify the GetQRev and SetQRev functions as shown in Figure 4, and modify AutoChart.cpp to #include PieDoc.h.

3. Add a BOOL method named Save to CAutoChart and implement it as shown in Figure 4. Note that Save accepts one parameter, an LPCTSTR specifying a pathname. An Automation client can call this function to save a pie chart to disk.

4. Add the following void method named Quit to the document class CPieDoc:

```
void CPieDoc::Quit()
{
    AfxGetMainWnd()->PostMessage
    (WM_CLOSE, 0, 0);
}
```

Remember, we're using the application's document class as the root of the object hierarchy. What the VB/VBA programmer sees as the Application object will in fact be our automated document object. By adding a Quit method to CPieDoc, you're in effect adding a Quit method to the Application object.

Our application now contains classes representing each of the four objects that make up Pie's object model. Now it's time to wire those classes up so that they form a hierarchy.

FORMING AN OBJECT HIERARCHY

I said in Part 1 that the secret to implementing Automation hierarchies is knowing how to expose one object as a subobject of another. The "secret" is to add a Get/Set property to the parent object that returns an LPDISPATCH value, which is another way of saying a pointer to an IDispatch interface. When you implement the property's Get function, return the

address of the subobject's IDispatch interface. It's that simple.

You can get a subobject's IDispatch address with CCmdTarget::GetIDispatch. Of course, you need to create the subobject before you can call GetIDispatch on it. That's easy, too: just make the subobject a data member of the parent object so that it will be created along with other member variables when its parent is created.

Here's how you arrange Pie's Automation objects to form a hierarchy:

1. Add three protected member variables to the class CPieDoc: a CAutoChart member variable named m_objChart, a CAutoWindow member variable named m_objWindow, and a CAutoToolBar member variable named m_objToolBar.

2. Use ClassWizard to add an LPDISPATCH Get/Set property named Chart to CPieDoc. Delete SetChart from the Set function box so the property will be read-only, and implement the GetChart function as follows:

```
LPDISPATCH CPieDoc::GetChart()
{
    return m_objChart.GetIDispatch
    (TRUE);
}
```

3. Repeat step 2 to add an LPDISPATCH Get/Set property named Window to CPieDoc. Edit GetWindow to look like this:

```
LPDISPATCH CPieDoc::
GetWindow()
{
    return m_objWindow
    .GetIDispatch (TRUE);
}
```

4. Repeat step 2 once more to add an LPDISPATCH Get/Set property named Toolbar to CPieDoc. Edit GetToolBar as follows:

```
LPDISPATCH CPieDoc::
GetToolBar()
{
    return m_objToolBar
    .GetIDispatch (TRUE);
}
```

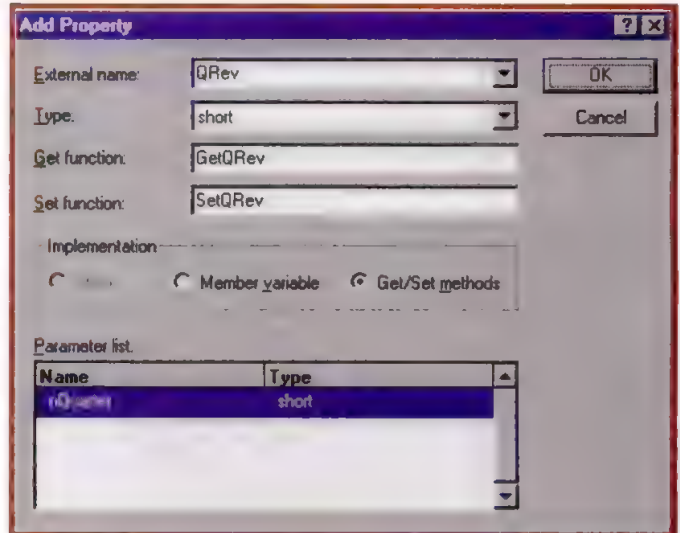


FIGURE 3: Creating an indexed property.

5. Manually edit the header files for CAutoChart, CAutoWindow, and CAutoToolBar to change the visibility of their destructors from protected to public. Pie won't compile until this change is made. Stop for a moment and consider the implications of the code you just added. When you add an LPDISPATCH-type property to object A and have it return the address of object B's IDispatch interface, you effectively make object B a child of object A in an Automation hierarchy. From the viewpoint of an Automation client, the subobject's name is the same as the property's name. Pie's top-level Automation object now has subobjects named Chart, Window, and Toolbar. A VB/VBA programmer can create an Application object with CreateObject and then use the methods and properties of the subobjects to create and save pie charts, show or hide Pie's window, and show or hide the toolbar.

All the code is in place. Now it's time to go for a test drive by programming our Automation server with a VBA script.

TEST DRIVE

To test Pie's dexterity as an Automation server, start Excel and execute an *Insert | Macro | Module* command. Then type in the following code:

```
Sub Test()
    Dim Pie As Object
    Set Pie = CreateObject
    ("Pie.Application")
    Pie.Window.Visible = 1
    Pie.Chart.QRev(1) = 420
    Pie.Chart.QRev(2) = 234
    Pie.Chart.QRev(3) = 68
    Pie.Chart.QRev(4) = 640
```

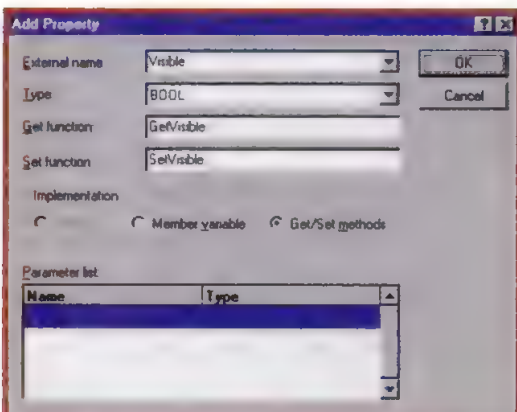


FIGURE 2: The Add Property dialog, poised to add a BOOL Get/Set property named Visible to an automatable class.

"My business can't stop when the power does..."

Back-UPS[®] Office's instant battery back-up can keep you up and running even when the power goes down.

only \$179.⁹⁹
list price

... I rely on
Back-UPS[®] Office[™] from APC.

\$30 REBATE

With the Purchase of a
Back-UPS Office

between August 1 and October 31, 1997.

You can download redemption card from our Web Site at www.apcc.com/english/promo025.htm or visit local retailers below for more info



"I've got Back-UPS[®] Office[™] from American Power Conversion. Back-UPS Office combines world class surge protection, a \$25,000 equipment protection guarantee* and instant, uninterruptible battery back-up power.

So when the power goes out, and it will.... I have plenty of time to save what I am working on and shut down safely.

Plus, I am protected from surge damage, keyboard lock-ups, data loss



Look for APC power protection products - starting at \$24.95

and power problems transmitted to my workstation over data and power lines."

So, if you just bought your first computer, or run a company that needs hundreds, you can depend on the reliability and peace of mind that comes with APC products. Why? It's simple. APC protects more computers for more companies in more countries than anyone in the world.

Now, that's a reason to smile.

CIRCLE 341 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

OfficeMax MICRO CENTER

FREE Consumer Catalog

- ☐ **YES!** I'd like to receive my FREE catalog.
☐ **NO,** I'm not interested at this time but please add me to your quarterly newsletter mailing list.

Name: _____
Title: _____
Company: _____
Address: _____
City/Town: _____
State: _____ Zip: _____ Country: _____
Phone: _____ Fax: _____
Brand of UPS used? _____ # _____
Brand of PCs used? _____ # _____
Brand of Servers used? _____ # _____

APC

888-288-APCC x8245

Fax: (401) 788-2787

www.apcc.com

E4-B0

APC's Back-UPS Office is available at:

Insight
800-859-5614

SWT

Fry's

Zone
800-258-2088

STAPLES
The Office Superstore

GLOBAL
COMPUTER SUPPLIES

©1997 APC. All Trademarks are the property of their owners. * See policy for details BF20EF

(800)347-FAJX PowerFax

E-mail: apcinfo@apcc.com

132 Fairgrounds Road, West Kingston, RI 02892 USA

APC has won more awards for reliability than all other UPS vendors combined.



SPEED FREAKS, POWER YOUR COMPUTER.



**FEATURING SDRAM MEMORY, AN ULTRA ATA HARD DRIVE
AND AGP CAPABILITY.**

MONGERS, SHOW-OFFS, IS READY.

NEW DELL DIMENSION XPS D300 300MHz PENTIUM® II PROCESSOR FEATURING MMX™ TECHNOLOGY

- 64MB SDRAM Memory
- 512KB Integrated L2 Cache
- NEW 8.4GB Ultra ATA Hard Drive with 512KB Cache (9.5ms)
- NEW 1200HS Monitor (17.9" v.i.s.)
- NEW Matrox Millennium II 8MB WRAM Video Card*
- 24X Max.⁵ Variable CD-ROM
- Creative Labs AWE64 Value Sound Card
- Altec Lansing ACS-490 Full Dolby Surround Sound Speakers with Subwoofer
- 56K Capable** U.S.R. x2 WinModem
- Iomega Zip 100MB Internal Drive
- Microsoft® Office 97 Small Business Edition plus Bookshelf 96
- MS Windows® 95/MS IntelliMouse
- 3 Year Limited Warranty with 1 Year On-site Service

\$3799

Business Lease⁴: \$134/Mo
Order Code #500928

NEW DELL DIMENSION XPS D300 300MHz PENTIUM II PROCESSOR FEATURING MMX TECHNOLOGY

- 64MB SDRAM Memory
- 512KB Integrated L2 Cache
- NEW 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000TX Trinitron® Monitor (15.9" v.i.s.)
- NEW STB Velocity 4MB AGP Video Card*
- 24X Max.⁵ Variable CD-ROM
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- 56K Capable** U.S.R. x2 WinModem
- Microsoft Office 97 Small Business Edition plus Bookshelf 96
- MS Windows 95/MS IntelliMouse
- 3 Year Limited Warranty with 1 Year On-site Service

PICTURED SYSTEM

\$2999

Business Lease: \$108/Mo
Order Code #500929

NEW DELL DIMENSION XPS D266 266MHz PENTIUM II PROCESSOR FEATURING MMX TECHNOLOGY

- 32MB SDRAM Memory
- 512KB Integrated L2 Cache
- NEW 6.4GB Ultra ATA Hard Drive (9.5ms)
- NEW STB Velocity 4MB AGP Video Card*
- 1000TX Trinitron Monitor (15.9" v.i.s.)
- 24X Max.⁵ Variable CD-ROM
- Creative Labs AWE64 Value Sound Card
- Altec Lansing ACS-290 Speakers with Subwoofer
- 56K Capable** U.S.R. x2 WinModem
- Microsoft Office 97 Small Business Edition plus Encarta 97
- MS Windows 95/MS IntelliMouse
- 3 Year Limited Warranty with 1 Year On-site Service

\$2799

Business Lease: \$101/Mo
Order Code #500927

NEW DELL DIMENSION XPS D233 233MHz PENTIUM II PROCESSOR FEATURING MMX TECHNOLOGY

- 32MB SDRAM Memory
- 512KB Integrated L2 Cache
- NEW 4.3GB Ultra ATA Hard Drive (9.5ms)
- 1000LS Monitor (15.9" v.i.s.)
- NEW STB Velocity 4MB AGP Video Card*
- 24X Max.⁵ Variable CD-ROM
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- 56K Capable** U.S.R. x2 WinModem
- Microsoft Office 97 Small Business Edition plus Bookshelf 96
- MS Windows 95/MS IntelliMouse
- 3 Year Limited Warranty with 1 Year On-site Service

\$2399

Business Lease: \$87/Mo.
Order Code #500926

Yeah, we're talking to you. The one who likes to be on the edge. Correction. Make that over the edge. Which is exactly where the Dell Dimension XPS D300 is going to take you, screaming at a processor speed of 300MHz. More than just the latest megahertz demon, we've equipped this Intel® Pentium® II processor-based system with some of the industry's fastest features around. Like high-speed SDRAM memory that "bursts" data twice as fast as EDO memory. Perfect for optimizing multimedia applications. And an Ultra ATA hard drive; fast, efficient and up to 8.4GBs big. With two times the data transfer rate of non-Ultra ATA hard drives. And the newest muscle-machine status symbol: Advanced Graphics Port video capability. Faster than the traditional PCI bus, this techno-workhorse boasts accelerated graphic performance for both 2D and 3D applications. So give us a call and we'll build you one of these monsters today. Then strap yourself in for a real power trip.

DELL

TO ORDER TOLL-FREE

800-247-6821

TO ORDER ONLINE

www.dell.com/buydell

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT
Sun 12pm-5pm CT In Canada* call 800-233-0702
GSA Contract #GS-35F-4076D

Keycode #04551

***Product, as configured, will ship by October 20. Please call for updated shipment information.**

*For a complete copy of our Guarantees or Limited Warranties, please write Dell U.S.A. L.P., Attn: Warranty, One Dell Way, Round Rock, TX 78682. *Leasing arranged by third-party leasing companies to qualified customers. *On-site service provided by an independent third-party provider. May not be available in certain remote areas. *4MB Baseboard with a 4MB Upgrade Module. *24X Max./12X Min. **x2 products are capable of 56Kbps. Due to FCC rules that restrict power output, however, current download speeds are limited to 53Kbps. Upload speeds are limited to 33 Kbps. Actual speeds may vary depending on line conditions. *Prices and specifications valid in the U.S. only and subject to change without notice. Intel, the Intel Inside logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. MS, Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation. ©1997 Dell Computer Corporation. All rights reserved.



SAVE

ON



GO TO

<http://subscribe.pcmag.com/free>

and get 22 issues
a year plus a
FREE Bonus Gift!

PCTech

```
short CAutoChart::GetQRev(short nQuarter)
{
    short nResult = -1;
    if ((nQuarter >= 1) && (nQuarter <= 4))
    {
        CFrameWnd* pFrame = (CFrameWnd*) AfxGetMainWnd();
        CPieDoc* pDoc = (CPieDoc*) pFrame->GetActiveDocument();
        nResult = (short) pDoc->GetRevenue(nQuarter - 1);
    }
    return nResult;
}

void CAutoChart::SetQRev(short nQuarter, short nNewValue)
{
    if ((nQuarter >= 1) && (nQuarter <= 4))
    {
        CFrameWnd* pFrame = (CFrameWnd*) AfxGetMainWnd();
        CPieDoc* pDoc = (CPieDoc*) pFrame->GetActiveDocument();
        pDoc->SetRevenue(nQuarter - 1, nNewValue);
    }
}

BOOL CAutoChart::Save(LPCTSTR pszPathName)
{
    CFrameWnd* pFrame = (CFrameWnd*) AfxGetMainWnd();
    CPieDoc* pDoc = (CPieDoc*) pFrame->GetActiveDocument();
    return pDoc->OnSaveDocument(pszPathName);
}
```

FIGURE 4: *CAutoChart's GetQRev, SetQRev, and Save functions.*

```
Pie.Window.Refresh
Pie.Chart.Save "C:\Chart.pie"
MsgBox ("Test Completed!")
End Sub
```

and select **Run | Start** (or press **F5**) to run it. (If you don't have Excel, any application that supports Visual Basic for Applications will do.) Pie should pop up on the screen and display a pie chart depicting the four quarterly revenue values shown in the script (see Figure 5). After the VBA program has ended, check the root directory of drive C:; there should be a file there named *Chart.pie*. This file was created when the VBA program called the Chart object's *Save* function. Double-click on the file icon and Pie will start as a standalone application and open the saved pie chart.

Congratulations! You've successfully implemented an Automation hierarchy. Now that you know how it's done, you can easily implement more sophisticated hierarchies, like those found in Microsoft Office applications.

A final thought before closing. Pie uses a two-level Automation hierarchy, but there's only one object—the Application object—in the hierarchy's uppermost tier. If you'd like to add more objects to this level, use ClassWizard

to create a class for each object and select *Creatable by type ID* in the New Class dialog rather than *Automation*. Enter an Automation name for the new object, and it, too, will be directly accessible via *CreateObject*. Then you

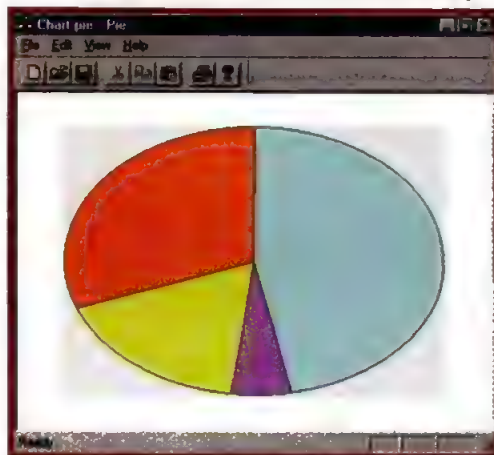


FIGURE 5: *This pie chart is created when you run the test VBA script in Excel.*

can add properties and methods as needed to create the new object's Automation interface. **PC**

Jeff Prosise is a contributing editor of PC Magazine and the author of Programming Windows 95 with MFC, published by Microsoft Press.

See new networking standards in motion.

GENERAL CONFERENCE • SECURITY SYMPOSIUM • COMMUNITY



World's #1 Networking Forum

Step inside NetWorld+Interop—the world's largest interactive learning center for mission-critical networking solutions. In only days you can learn how to deploy the most advanced networking, Internet and intranet technologies on the planet. NetWorld+Interop has the expert knowledge and training you need to unleash a new generation of cutting-edge applications. Ones that give your organization the agility, power and flexibility to move forward—faster.

Atlanta, Georgia
Georgia World Congress Center
October 6-10, 1997

For Registration/Information:

1-800-944-4629

Int'l 415-372-7090

www.interop.com

SOFTBANKFORUMS

**NETWORLD
+ INTEROP**

Tomorrow's Technologies In Action

See and test the technologies that will run your enterprise 2 years from now. NetWorld+Interop builds and manages the most diverse, enterprise-class, multivendor network in the world: the InteropNet™. Connecting over 600 top vendors to the Internet, the InteropNet lets you evaluate the newest standards in networking, live on the exhibition floor. This is your one chance to see emerging technologies at work, so do not get caught standing still. Pre-register to attend now.

© 1997 SOFTBANK FORUMS. NetWorld is a registered trademark and InteropNet is a trademark of SOFTBANK FORUMS. NetWorld is a service mark of Novell, Inc. All other names are the property of their respective holders. CBI7ESPA

CIRCLE 352 ON READER SERVICE CARD

Experience Innovation



MITAC 5027 Has All The Bells & Whistles. And That's For Sure!

Flip the pages of any magazine, anywhere in the world. You will not find one notebook that's as cool as MITAC 5027. NONE! When it comes to price/performance, nothing nears this sleek master of all notebooks.

That's simply why BYTE named it the coolest notebook at Computex '97. And just how many notebooks were displayed at the show? Thousands!

Let's not sound our own trumpet. Just take a look at the smart system's specs, compare them with others and contact us today.



- Super large 14.2" TFT SVGA/XGA LCD
- Up to 233 MHz Intel® Pentium® processor w/MMX™ technology
- Up to 128MB EDO RAM
- Up to 4MB video memory
- 16-bit 3D sound support
- Swappable modular bay for CD-ROM/FDD
- Attachable 2nd battery
- Full-size keyboard
- Ergonomic AC-adaptor
- 512KB cache

* The Intel Inside Logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation.

* Specifications are subject to change without notice.

COMDEX Fall '97

November 17-21, 1997
Las Vegas Convention Center
Visit MITAC at Hall S-2, L2436

For regional dealer/retailer, please contact

SYNNEX INFORMATION TECHNOLOGIES, INC.

Tel: 1-800-7563888 Fax: 1(510)4403777

E-mail: ckc@synnex.com



Global Resources Serving Individual Needs

(URL): <http://mitac.mic.com.tw/>

For ODM/distribution, please contact

MITAC INTERNATIONAL CORP. (TAIWAN)

Tel: 886(3)3289000 Fax: 886(3)3280928

E-mail: market@smtpink.mic.com.tw

MITAC USA INC.

Tel: 1(510)6563333 Fax: 1(510)2526930

E-mail: davidli@synnex.com

Make Telephone Numbers More Memorable

What words does your phone number spell out? Foneword/32 finds them for you.

By Neil J. Rubenking

Telephone numbers are hard to remember. Words are easier. You might forget 266-7883, but if you spell it out as COMPUTE, you won't forget it. When your phone number spells a word or phrase that expresses something about yourself or your business, you have a telephone number nobody could forget. Such mnemonic phrases are sometimes called vanity numbers, but we'll call them *fonewords*. Foneword/32, this issue's utility, consults a dictionary of nearly 80,000 words to help you find the best foneword for your telephone number.

Foneword/32 updates an earlier *PC Magazine* utility called Foneword, published in 1993. Foneword, written in Visual Basic 3, relied on VB3's database support for dictionary handling and used VB3's original setup kit for installation. A full installation of Foneword took up more than a megabyte, and the setup program sometimes failed when another VB program was running. What's more, searching the dictionary database was slow.

Foneword/32 has been rewritten from the ground up in Borland's Delphi 3 and uses its own storage mechanism. It requires no support files other than the dictionary itself, and it's blazingly fast. Foneword/32 runs under Windows 95 or Windows NT 3.51 or later.

You can obtain Foneword/32 by downloading it from PC Magazine Online or by mail. For details, see the sidebar "Guide to Our Utilities.") The source code is also provided for those interested in seeing how it works.

USING FONEWORD/32

Foneword/32 is supplied as a self-contained installation program. Run it to install Foneword/32 and all associated files in the directory

of your choice. The installation program will add Foneword/32, its help file, and an uninstall utility to your Start menu or Program Manager.

The first time you launch Foneword/32 you'll see that its interface looks just like a telephone. (See the screenshot on the left side of Figure 1.) Enter a phone number of up to ten digits by clicking on the telephone's buttons, or you can type the number. Any letters you type will show up as the numbers that correspond to them on a telephone keypad, which gives you a handy way to convert fonewords back into ordinary telephone numbers. (Since U.S. telephones do not include a numerical equivalent

Foneword/32

Foneword/32 consults a dictionary of nearly 80,000 words to help you find the best word or phrase your telephone number "spells." Running under Windows 95 and Windows NT 3.51 or later, Foneword/32 is much faster than the previous version and offers an entertaining telephone-like interface.



for Q or Z, the program ignores those letters.) Press the Esc key or click on the Clear button to clear the telephone number completely. Press the Backspace key or click on the Delete button to delete the last digit.

The small speaker icon just below the telephone number controls Foneword/32's beep tones. Click the icon or press Ctrl-B (for *beep*)

to toggle beeps on and off. If beeps are on, each time you enter a digit you'll hear the same Dual Tone Multi-Frequency (DTMF) tone that a touch-tone telephone makes for that digit. Take note—they are *precisely* the tones your telephone generates. Try holding your telephone's mouthpiece next to the computer's speaker while you type a number into Foneword/32. If there's a dial tone, doing so will usually dial the telephone. If you frequently work with a speakerphone turned on and your computer's volume high, you should turn off Foneword/32's beeps.

Once you've entered the telephone number, click on one of the three action buttons below the number buttons or hold down the Alt key and type the first letter of the button's caption. Start with *All real words* or Alt-A. Foneword/32's main window will open up to make room for the results. (See the screenshot on the right side of Figure 1.) You'll get a list of any perfect fonewords—ones in which every digit is replaced by a letter and the letters spell actual words. For example, JAVA YUM and SYNERGY are perfect fonewords. Because the digits 0 and 1 don't correspond to letters, they are not converted, so you can get results like NUMBER 1 or 0 CHARGE.

Some telephone numbers don't correspond perfectly to any fonewords. Others offer only undesirable results, such as I BE UGLY or STINKER. In such a case, click on the *Some real words* button (or type Alt-S). You'll get a list of partial fonewords containing at least one real word of a reasonable length, like 5 BUCKS 5 or BREAK 31, sorted to show those containing the longest words first. Within each group of fonewords whose longest word is the same length, the ones with the fewest unprocessed digits come first. Naturally, any perfect fonewords will also show up in this list.

When you click on the *Just letters* button (or type Alt-J), Foneword/32 ignores its dictionary and displays *all* combinations of letters that represent the input telephone number. There can be quite a few of these. A ten-digit telephone number containing no 0's or 1's has 59,049 possible text representations. Scanning the list can pay off, though—words don't have to be spelled correctly to be memorable. Nobody will forget a barbershop's telephone

FOR PROGRAMMERS ONLY Foneword/32 was written with Delphi 3, Borland's visual programming tool. The full source code is available from PC Magazine Online and demonstrates the following programming techniques:

- using SetWindowRgn to give a window a distinctive shape, such as ellipses, rounded rectangles, and other polygons;
- determining the most efficient way to pack data for storage, and in particular using a different number system, in this case ternary numbers;
- using a binary search to home in quickly on ordered data in a file.

SUPPORT Help for *PC Magazine's* free utilities can be obtained in our online discussion areas, both on the World Wide Web (www.pcmag.com/discuss.htm) and on ZDNet in the Utilities section of ZDNet's TIPS Forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum daily. You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

WWW.PCMAG.COM

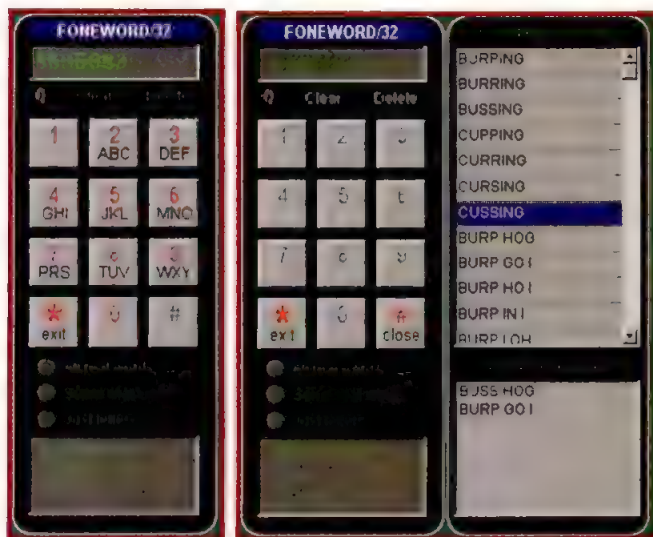


FIGURE 1: Enter a telephone number by clicking on buttons, typing numbers, or typing letters (left). Foneword/32's window displays possible vanity numbers (right).

number if the foneword is KUT-HAIR!

Each time you click on one of the action buttons, Foneword/32 displays its results in the Possible Fonewords list. When you find a good one, you need to put it into the Selected Fonewords list. Double-click on a foneword to select it, drag it to the Selected Fonewords list with the mouse, or right-click on the list and choose *Select foneword* from the menu. If you're using the keyboard, highlight the foneword and press Enter.

You can save the Possible Fonewords and Selected Fonewords lists to text files for later perusal. Right-click on the desired list and choose *Save list* from the pop-up menu or tab to the desired list and then press F2. Foneword/32 will propose a default filename consisting of the telephone number followed by ".possible.TXT" or ".selected.TXT," but you can choose any name you wish.

You can try the other action buttons while the foneword lists are displayed, but when you want to work on a different telephone number you must close the main window first. Click on the pound (#) button (also called number sign or *octothorp*) or type a # on the keyboard. Click on the asterisk (*) button (also called star) or type an asterisk to shut down Foneword/32.

As you move the mouse around, you'll notice that the text in the panel below the action buttons changes to describe what's under the mouse cursor. You can also right-click on any of Foneword/32's components and choose *What's This?* from the menu for a more detailed description.

That's all you need to know. You're ready to find some fonewords.

INSIDE FONEWORD/32

Foneword/32's most distinctive visual feature is its main window. Not only is it not rectangular, but it's in two separate parts. We'll examine the surprisingly simple technique that produces this kind of window. We'll also look at the unusual file structure used by Foneword/32's dictionary to minimize storage space and search time.

THAT BIZARRE WINDOW!

Windows defines an area on the screen by means of a data structure called a *region*. The Windows API includes

functions that create elliptical, rectangular, and rounded rectangular regions, as well as polygonal regions defined by a series of points. Two regions can be combined to form a new region consisting of an area found in both regions (intersection), in either region (union), in one but not the other (difference), or in either but not both (XOR). Other functions paint a region, return the smallest rectangle that will contain it, determine whether a point lies inside it, and so on. Most of the functions exist in both 16-bit and 32-bit Windows.

The API function that makes Foneword/32's unusual window possible is called `SetWindowRgn`, and it's only available in 32-bit Windows. Pass a region and a window handle to this function and Windows will limit your window's area to the specified region, regardless of shape. Any point outside the region is not treated as part of the window.

Foneword/32 defines a rounded rectangle region for its initial display state and a second region consisting of two separate rounded rectangles for its open state. It stores the handles of both these regions and calls `SetWindowRgn` as necessary to open or close the window. Here's the code that initially defines those regions:

```
BorderStyle := bsNone;
BodyRgn := CreateRoundRectRgn
            (2, 2, 171, 432, 32, 32);
OpenRgn := CreateRoundRectRgn
            (2, 2, 171, 432, 32, 32);
OffsetRgn(OpenRgn, 170, 0);
CombineRgn(OpenRgn, OpenRgn,
            BodyRgn, RGN_OR);
R1 := CreateRoundRectRgn
```

```
(2, 2, 171, 432, 32, 32);
```

```
CombineRgn(R1, BodyRgn, R1,
            RGN_COPY);
SetWindowRgn(Handle, R1, True);
```

After a call to `SetWindowRgn`, the program no longer owns the passed region, which then belongs to the system. Thus Foneword/32 makes a copy of the region and passes the copy to `SetWindowRgn`.

Two more region-manipulation functions handle painting the background and frame of the main window. `FillRgn` fills a region with color, and `FrameRgn` draws a frame around the region's edges. The shape of the region doesn't matter, and it need not be a single continuous shape.

When you limit a window to a specific region, you generally lose access to the system menu and title bar, along with the title bar icons. That leaves a user with no way to move the window. You'll need to provide a substitute for the title bar. Foneword/32 offers a substitute for the title bar by responding to the `WM_NCHITTEST` message. This system message lets a program define non-client areas like the title bar. If the screen location passed with this message is within the boundaries of the label at the top of the screen, the message handler returns the value `htCaption`, causing Windows to treat the label as if it were a title bar. The user can then drag the window using the label.

To make the label even more like a title bar, Foneword/32 changes its color to reflect the window's active/inactive status. The program responds to the `WM_NCACTIVATE` message

NUMBERS TO WORDS									
Phone number	2	2	2	2	2	4	3		
0-letter	A	A	A	A	A	G	D		
1-letter	B	B	B	B	B	H	E		
2-letter	C	C	C	C	C	I	F		
Ternary number	2	0	1	1	0	0	1		

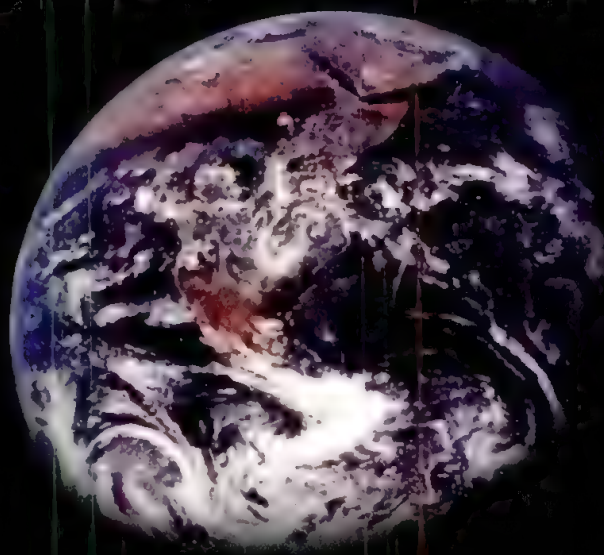
FIGURE 2: The Foneword/32 dictionary stores words in compact form, combining the telephone number (top row) and a code for which of the three possible letters to use (bottom row).

and sets the label's background and font colors to `clActiveCaption` and `clCaptionText` if the window is active, or `clInactiveCaption` and `clInactiveCaptionText` if not.

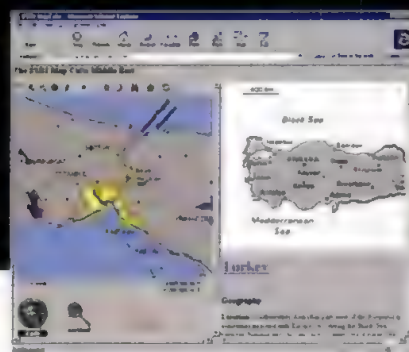
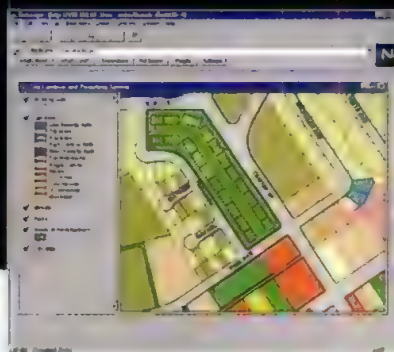
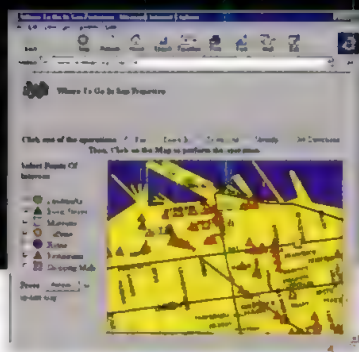
PACKING FONEWORDS

In order to determine whether a telephone number can spell real words, Foneword/32 consults a dictionary file containing more than 79,500 words of one to ten letters. None con-

The number of people who use
your mapping database is about to increase...



...by about 20 Million



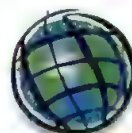
Introducing the ArcView Internet Map Server... The best way to put live maps on the Web!

Content. It's what the Web is all about. Now you can bring rich visual and intuitive information content to your Web site by adding live maps! The ArcView® Internet Map Server for ArcView GIS provides an out-of-the-box solution for placing maps on the Web.

Powerful—The ArcView Internet Map Server includes a prebuilt, interactive Java™ applet, the ESRI MapCafé™ that allows your Web site visitors to pan, zoom, identify map features and perform other interactive map exploration functions. Publishing maps on your Web site has never been easier.

Flexible—The ArcView Internet Map Server lets you publish maps derived from more than a dozen popular geographic data formats including ArcView GIS shapefiles, ARC/INFO® coverages, CAD drawings, and numerous image formats.

ArcView Internet Map Server...the solution of choice for publishing maps on the World Wide Web.



ESRI

1-800-447-9778

Fax: (909) 307-3051

E-mail: info@esri.com

Web: www.esri.com

International: (909) 793-2853,
extension 1235



ArcView Internet Map Server

GIS for Everyone™—Now on the World Wide Web

CIRCLE 240 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

ESRI, the ESRI logo, ArcView, the ArcView logo, and MapCafé are trademarks of Environmental Systems Research Institute, Inc. (ESRI). ArcView and MapCafé are registered trademarks of ESRI. Java is a trademark of Sun Microsystems, Inc. Microsoft, the Microsoft logo, and Internet Explorer are trademarks of Microsoft Corporation. The Microsoft logo is a trademark of Microsoft Corporation. Other company names and product names mentioned herein are trademarks or registered trademarks of their respective trademark holders.

BOOK The Ben



www.pcmag.com
At the top of
discriminating
bookmark lists
everywhere.



Your link to
the best of the
best products in
every category.

How do you want your information?
Up-to-date... or up-to-the-minute? There's simply no more timely source for vital product information than PC Magazine Online.

In fact, with a dedicated staff of writers and editors who continuously refresh and up-date PC Magazine Online's content, this is as close to "live" as the industry gets.

At www.pcmag.com you'll also find other valuable resources that you can't get anywhere else — not even in PC Magazine. Industry news and trends literally as they are happening. Plus valuable multimedia

NEWSWATCH

What's happening today, and what it means — along with up-to-the minute news streamed from the industry press.

INSITES

HARD-HITTING OPINIONS, AND SAVVY WEB INSIGHTS FROM MICHAEL J. MILLER (EDITOR-IN-CHIEF), DON WILLMOTT (EXECUTIVE EDITOR, ONLINE), PLUS "NEWS, VIEWS AND SNIDE ASIDES" FROM JOHN C. DVORAK.

MARK chmark.

InternetUser

The most complete and current guide to Internet software and tools — an indispensable resource for any serious Netizen.

content that seamlessly complements and enhances the print edition, and makes it easy (even fun) to dig out that exact nugget of information you need.

Take advantage of customizable product comparisons and interactive navigation tools that streamline product selection.

Follow-up links to earlier PC Magazine articles. And, of course, stay a step ahead of the pack on the very latest hardware, software and technology developments.

So drop in, any time — but plan to stay awhile. You'll find lots of good reasons to add one more URL to your "daily" folder: www.pcmag.com.

PC LABS Online

ALL THE GOOD STUFF YOU EXPECT FROM PC LABS, WITH INTERACTIVE FEATURES THAT MAKE IT EVEN EASIER TO DRILL DOWN TO THE INFORMATION YOU NEED.



THE
BENCHMARK

tains a Q or Z. (Yes, some telephones do show Q and Z associated with particular digits, but most do not.)

In the dictionary file, each word is represented by two numbers. The first is the telephone number corresponding to the word, stored as an integer using from one to five bytes. The second is a base-3 (ternary) number that identifies which of the three letters—first, second, or third—associated with each number on a telephone should be used for each digit. Just as every binary digit can have a value of 0 or 1, every ternary digit can have a value of 0, 1, or 2. A ternary digit of 0 means use the first of the three possible letters, a 1 means use the second, and a 2 means use the third. This storage scheme lets Foneword/32 find the word or words corresponding to a given string of numbers very quickly.

An example will make this clear. The first seven-letter word in our dictionary is stored as 2222243 (the telephone number) and 767 (1001102 in ternary notation). The digits of the ternary number are used from right to left, so in order of use they are 2011001. Figure 2 shows how the two numbers translate into a specific word. As you can see, the word is CABBAGE.

It takes 24 bits to store the largest possible seven-digit number—9,999,999—and 12 bits to store a seven-digit ternary number—2222222 (2,186 in decimal). A seven-letter word stored using this scheme requires 36 bits of information rather than the 56 bits that would be required to store the letters. Not only that, matching the word to the corresponding telephone number is automatic.

In practice, instead of packing the bits of the telephone number and ternary number into a single bit-string, Foneword/32 stores them using whole bytes. That means that one-letter, three-letter, six-letter, and eight-letter words use 1 byte more than they would if they were bit-packed. However, the resulting 6

percent reduction in dictionary size would have come at the cost of making each word lookup slower and more complex.

UNPACKING FONEWORDS

Words are sorted in the dictionary according to length. First come one-letter words, then two-letter words, and so on, up to ten-letter words. The dictionary file begins with a header that defines the beginning and ending offsets for each group of words. The data itself begins immediately after the header. Within each of the ten chunks of word data, words are sorted by telephone number. Each word takes from 2 to 7 bytes to store, depending on its length.

To get the word or words corresponding to a particular string of numbers, Foneword/32 performs a binary search within the portion of the file defined by the beginning and ending offsets for the string's length. This method, which requires that the data file be presorted, is immensely faster than the database-dependent code used by Foneword/32's predecessor. In a binary search, each comparison eliminates half the remaining possibilities, so searching the nearly 18,000 eight-letter words (the largest group) will take no more than 15 comparisons.

To determine whether the specified string of digits matches one or more dictionary entries, the function TryWord first converts it to a 4-byte Integer (plus an extra byte for the tenth digit of ten-character strings). The variable iBot represents the bottom of the search range, and is initially set to 0. The variable iTop represents the top of the range. Its initial value is the total number of words of the required size.

Each time through the binary search loop, the variable iMid is set midway between iBot and iTop. If the data indexed by iMid is less than the wanted value, the lower half of the range is discarded by setting iBot to iMid+1. If

the data is greater than the wanted value, the upper half of the range is discarded by setting iTop to iMid-1. Of course, if the data equals the wanted value, the code breaks out of the search loop.

There may well be more than one foneword for a given string. For example, the words ACRES, BARDS, BARER, BARES, BARFS, BASER, BASES, CAPER, CAPES, CARDS, CARER, CARES, and CASES all correspond to 22737. If the binary search loop ends with success, the TryWord function backs up through the file to find the first word matching the input number. Then it moves forward, decoding each matching item into a word and adding that word to the string list T.

Decoding a stored foneword is a simple matter of reversing the packing process described in the previous section. Each digit in the numeric string passed to TryWord corresponds to one of three characters. The ternary number found in the dictionary is the key to decoding this string. The function DecodeNumber steps through the string one character at a time and uses the last digit of the ternary number to determine which character to use. Then it discards that last digit. To get the last digit, we take the ternary value MOD 3. To discard it, we replace the ternary value with itself DIV 3.

Foneword/32 is fun to use, and it provides handy mnemonic telephone numbers for your home or business. If you're a programmer, you'll surely want to try some distinctive window shapes in your own programs. As Foneword/32 demonstrates, while databases are convenient general-purpose tools, a data storage technique specific to an individual program can often pay off in reduced storage requirements and increased efficiency. **PC**

Neil J. Rubenking is contributing technical editor of PC Magazine.

GETTING THE FILES



Here's how you can access PC Magazine Online, where you'll find all our utilities and other PC Tech files:

ZDNET To join CompuServe/ZDNet (formerly Ziff-Net), call 800-895-4596 (voice) and request the PMZ offer. CompuServe members can join ZDNet by typing GO ZIFFMEM at any CompuServe ! prompt. You can get the current utility by typing GO FREEUTIL at any CompuServe ! prompt. Other PC Tech Files are available individually, in the Utilities / Tips Forum, and bundled within volume archive files.

INTERNET You can obtain the utility and an issue archive file by visiting our World Wide Web site at www.pcmag.com/download.

You can also get the files through anonymous FTP from our Internet site. The address is [ftp.zdnet.com](ftp://ftp.zdnet.com). Use the word anonymous as your log-on name and any of your e-mail addresses as the password. Look in the subdirectory [/pcmag/1997/1021/](ftp://ftp.zdnet.com/pcmag/1997/1021/). The volume archive filename is v16n18.zip. The utility and archive are compressed with PKZIP, Version 2.04.

BY FAX OR MAIL If you don't have a modem or Internet access, you can fax 508-368-0141 or write to PC Magazine Utilities, c/o Image Software Services, 67 Buena Vista St., Devens, MA 01432.

The programs presented in PC Magazine can be copied but are copyrighted. You may make copies for others if no charge is involved, but making copies or using any portion for any commercial purpose is strictly prohibited.

User-to-User

BY NEIL J. RUBENKING

Enable Filename Completion In Windows NT 4

I use Windows NT 4.0, and I came across this handy tip a while back. (I don't know whether it works in Windows 95.) If you set a particular item in the Windows NT Registry, you get filename completion by pressing the Tab key when you have partially typed in a filename or directory name. Run RegEdit and navigate to the key HKEY_CURRENT_USER\Software\Microsoft\Command Processor. In the right-hand pane, double-click the value named CompletionChar and set its value to 9.

This is similar to Unix's ability to complete a filename when you hit the Esc key after typing in a partial filename. Windows NT's version is actually better, though, in that it will cycle through multiple filenames. For example, if you enter "EDIT FOOBAR" and press Tab repeatedly, the system will replace "FOOBAR" with the fully qualified filenames that match this pattern. So if you have files in the current directory called FooBar.txt, FooBar.doc, and FooBar2.txt, hitting Tab will present each filename, one at a time, for your perusal. When

COLOR CODES

Value	Color	Value	Color
0	black	8	dark gray
1	blue	9	bright blue
2	green	A	bright green
3	cyan	B	bright cyan
4	red	C	bright red
5	magenta	D	bright magenta
6	brown	E	yellow
7	light gray	F	white

FIGURE 1: Use these values to control the foreground and background colors in command prompt windows.

you find the one you want, just hit Enter to proceed. Of course, you may not use the command line much anymore, but this is still a nice little trick to remember.

ROGER MARTIN
via the Internet

PC MAGAZINE: The filename-completion feature will be available immediately in all command prompt windows opened after you make the Registry change; there's no need to restart Windows NT. Note, too, that you can use a character other than Tab (ASCII 9) simply by using the character's ASCII code as the

data for CompletionChar. Tab is probably the best choice, however. It's easily accessible, and rarely if ever required on the command line. This is a Windows NT-only tip; Windows 95 doesn't have an equivalent Command Processor key in its Registry.

While you have the Command Processor key open in RegEdit, there's another change you might want to make. The value named DefaultColor controls the foreground and background colors used in command prompt windows. It has a default value of 0, for standard white text on a black background. You can replace this value with a two-digit hexadecimal number, in which the first digit selects a background color and the second a foreground color. Figure 1 shows which colors each digit produces. A value of F0, for example, would give black text on a white background, and 1E would yield yellow text on a blue background.

Clearing the Recent Documents List

I wondered if it were possible to have Windows automatically clear the documents history from the Start menu without using some third-party utility. I discovered that it could be done by adding this line to your Autoexec.bat.

```
del c:\windows\recent\*.lnk
```

This may be a useful tip for those who do not want their document history to be accessed by others.

RUDY HEDAYI
via the Internet

PC MAGAZINE: Each time you modify a file associated with a modern Windows program, Windows adds that file's name to the document history list, accessed by selecting Documents from the Start menu. When the list fills up, each new item displaces the oldest one. The purpose of this list is to let you quickly reload files you've recently edited. Nonetheless, anyone who sits down at your computer can see exactly what you've been doing by looking at the history list. In order to protect your company's secrets (or your own!), you may prefer to clear the document history list.

The TweakUI utility, part of Microsoft's free and unsupported Power Toys utility set, includes the ability to clear the document history and other history lists automatically. However, some systems may not be perfectly

compatible with TweakUI. Placing the line shown above in your Autoexec.bat file is a simple way to clear the document history at the start of every Windows session. If your system has User Profiles enabled, you'll have to use a slightly different line. Suppose your profile name is BigBoss. You would insert Profiles and the profile name into the path thus:

```
del c:\windows\Profiles\BigBoss\recent\*.lnk
```

Just substitute your actual profile name for BigBoss in the line above. And of course, if your Windows directory is not c:\windows, make that change as well.

To clear the document history while Windows is running, you can issue the same command in a DOS box or delete the contents of the Recent directory from within Explorer. Or, even easier, right-click the Taskbar and select Properties from the popup menu. Click on the Start Menu Programs tab in the resulting dialog and press the Clear button.

Detect File-System Changes The Easy Way

Here's a technique I use to find out which files have been added or modified after I install new software. The technique works with Windows 3.1 using MS-DOS 5.0 or later, Windows 95, or Windows NT 3.51.

First, take a "before" snapshot of your hard disk from the DOS command line or a DOS window, using the following command:

```
DIR C:\ /ON /S > BEFORE.TXT
```

This creates a file named Before.txt containing a list of all files on the C: drive, including sub-directories, alphabetized by filename. Next, after you install your new software, take an "after" snapshot of the disk:

```
DIR C:\ /ON /S > AFTER.TXT
```

Finally, to generate a file named Result.txt showing all the files that are new or have been modified, use the following command:

```
FC /L /LB9999 BEFORE.TXT AFTER.TXT > RESULT.TXT
```

Figure 2 shows a sample Result.txt. You can tell that the file Modified.ex has changed because of its later date, and you know that the



**COMPUTER
DISCOUNT
WAREHOUSE**

The right price.
The right advice.

TM

Outstanding

COMPUTER DISCOUNT WAREHOUSE

TOSHIBA

Equium Series PCs

A complete personal computing solution



Monitor sold separately

Desktop	CPU	RAM	Hard drive	CD-ROM	Price	CDW
5160D	166MHz Pentium MMX	32MB	2.07GB	12X	\$1418.82	84248
5200D	200MHz Pentium MMX	32MB	2.38GB	12X	\$1549.64	84249
5230D	233MHz Pentium MMX	32MB	3GB	24X	\$1798.36	95209
6230D	233MHz Pentium II	32MB	3GB	24X	\$2199.43	95208
Mini-tower	CPU	RAM	Hard drive	CD-ROM	Price	CDW
6260M	266MHz Pentium II	32MB	3.73GB	16X	\$2569.07	93106



**HEWLETT
PACKARD**



HP Brio Series PCs

Monitor sold separately

Mini-tower	CPU	RAM	Hard drive	CD-ROM	Modem	Price	CDW
8012	166MHz Pentium MMX	16MB	2.1GB	—	—	\$999.53	95050
8014	200MHz Pentium MMX	16MB	2.1GB	—	—	\$1184.35	95052
8017	233MHz Pentium MMX	32MB	3.2GB	—	—	\$1449.95	95053
8172	166MHz Pentium MMX	16MB	2.1GB	16X Max	56K bps	\$1379.29	95057
8174	200MHz Pentium MMX	32MB	2.1GB	24X Max	56K bps	\$1635.54	95058
8175	200MHz Pentium MMX	32MB	2.1GB	24X Max	56K bps	\$1749.63	95059
8177	233MHz Pentium MMX	32MB	4GB	24X Max	56K bps	\$1869.90	95060
8178	233MHz Pentium MMX	32MB	6GB	24X Max	56K bps	\$2117.37	95061



IBM PC 300GL Series



Monitor sold separately

CPU	RAM	Hard drive	CD-ROM	Price	CDW
166MHz Pentium MMX	16MB	2.5GB	—	\$1179.37	89298
166MHz Pentium MMX	32MB	2.5GB	—	\$1359.46	94858
200MHz Pentium MMX	32MB	2.5GB	—	\$1474.74	95162
166MHz Pentium MMX*	32MB	2.5GB	—	\$1419.28	85405

*Includes Windows NT Workstation V4.0

IBM 300PL Series



Monitor sold separately

Desktop	RAM	Hard drive	CD-ROM	Price	CDW
200MHz Pentium MMX	32MB	2.5GB	—	\$1649.23	94012
200MHz Pentium MMX	32MB	4.2GB	—	\$1759.99	94013
200MHz Pentium MMX	32MB	4.2GB	24X	\$1899.67	94014
233MHz Pentium MMX	32MB	4.2GB	24X	\$2059.63	95760
233MHz Pentium MMX	32MB	4.2GB	24X	\$2199.59	95759
Mini-tower	RAM	Hard drive	CD-ROM	Price	CDW
166MHz Pentium MMX	32MB	2.5GB	—	\$1599.49	95762
200MHz Pentium MMX	32MB	4.2GB	24X	\$1999.83	95763
233MHz Pentium MMX	32MB	4.3GB	24X	\$2649.99	95764*

*Includes Windows NT Workstation V4.0, Ultra SCSI hard drive

COMPAQ

Deskpro 2000 Series

Affordable, manageable desktop PCs for business environments

- Intel Pentium® processors with MMX technology
- 256KB Level 2 cache
- 16MB or 32MB SDRAM standard
- 2.1GB or 3.2GB S.M.A.R.T. EIDE hard drives
- CDS models include internal 16X Max EIDE CD-ROM drive and Enhanced Business Pro Audio
- Integrated S3/V2 enhanced 64-bit graphics
- 1MB SGRAM standard, expandable to 2MB
- Expansion slots: two PCI; one shared PCI/ISA; two ISA
- Ports: serial; ECP parallel; two USB; keyboard; mouse; video
- Microsoft Windows® 95
- Intelligent Manageability
- 3-year parts, 1-year labor and on-site repair warranty

NEW models!

CDW is the #1 mail-order reseller of Compaq products

Desktop	CPU	RAM	Hard drive	CD-ROM	Price	CDW
5166X/2100	166MHz Pentium MMX	16MB	2.1GB	—	\$1199.00	92269
5166X/3200	166MHz Pentium MMX	16MB	3.2GB	—	\$1309.00	92838
5200X/2100	200MHz Pentium MMX	16MB	2.1GB	—	\$1389.00	92840
5200X/3200	200MHz Pentium MMX	32MB	3.2GB	—	\$1579.00	92841
5233X/3200/CDS	233MHz Pentium MMX	32MB	3.2GB	16X Max	\$1949.00	92843
Mini-tower	CPU	RAM	Hard drive	CD-ROM	Price	CDW
5166X/3200/CDS	166MHz Pentium MMX	32MB	3.2GB	16X Max	\$1619.00	92839
5200X/3200/CDS	200MHz Pentium MMX	32MB	3.2GB	16X Max	\$1769.00	92842

Monitor sold separately

800-998-4239

Free configuration of your new PC purchase at CDW

selection and value from the PC leaders

FUJITSU

LifeBook 435Dx

Designed for a mobile life

- 133MHz Intel Pentium® processor with MMX technology
- RAM: 16MB standard, expandable to 80MB
- 1.3GB hard drive
- 10X CD-ROM drive
- 12.1" SVGA dual-scan color display

\$1799.00

CDW 95295



IBM

Business Partner

IBM ThinkPad 380 Series



CDW
is the #1
mail-order
reseller of **IBM**
products

Model	CPU	RAM	Hard drive	CD-ROM	Color display	Price	CDW
380	150MHz Pentium	16MB	1.0GB	Optional	12.1" dual scan	\$1899.46	86302
380C	150MHz Pentium	16MB	1.35GB	8X	12.1" dual scan	\$1999.50	86304
380C	150MHz Pentium MMX	16MB	2.1GB	8X	12.1" active matrix	\$3069.78	86305

Armada 1500 Series

All-in-one approach to business

COMPAQ

The Compaq Armada 1500 Series integrates a multitude of features into one sleek, easy-to-use package. It gives you simultaneous access to the hard drive, floppy disk drive, 10X CD-ROM drive, integrated AC adapter and 33.6K bps modem—so everything you need is at your fingertips. And because it's reliable and easy to manage and maintain, it helps control the hidden costs of PC ownership.

Model	CPU	RAM	Hard drive	CD-ROM	Color display	Price	CDW
1530DM	133MHz Pentium MMX	16MB	1.4GB	10X	12.1" dual scan	\$2499.00	91507
1550DMT	133MHz Pentium	16MB	1.4GB	10X	12.1" active matrix	\$2999.00	87070
1580DMT	150MHz Pentium MMX	16MB	2.1GB	10X	12.1" active matrix	\$3499.00	90659

Call for the Armada 7300 and 7700 Series notebooks!



Libretto 50CT

- 75MHz Intel Pentium® processor
- 16MB EDO DRAM standard, expandable to 32MB
- 772MB hard drive
- 1.44MB external floppy drive PC Card
- 6.1" active-matrix color display

\$1929.45 CDW 90350

Tecra 510CDT

- 133MHz Intel Pentium® processor
- 16MB EDO RAM standard, 144MB maximum
- 2.1GB hard drive
- 10X CD-ROM drive
- 12.1" active-matrix SVGA color display
- 28.8K bps data/fax modem

\$2659.76 CDW 77241

Tecra 520CDT and 530CDT

- 166MHz Intel Pentium® processor with MMX technology
- 32MB EDO DRAM standard, expandable to 160MB
- 2.02GB hard drive
- 10X CD-ROM drive
- 12.1" active-matrix SVGA (520CDT) or XGA (530CDT) color display
- 33.6K bps internal data/fax modem

520CDT **\$4159.45** CDW 90355

530CDT **\$4579.17** CDW 90359



TOSHIBA

Satellite Pro 440CDX and 440CDT

- 133MHz Intel Pentium® processor with MMX technology
- 16MB EDO RAM standard, expandable to 144MB
- 1.34GB hard drive
- 10X CD-ROM drive
- 12.1" FastScan dual-scan (440CDX) or active-matrix SVGA (440CDT) color display
- 33.6K bps internal data/fax modem (440CDT only)

440CDX **\$2359.54** CDW 90351

440CDT **\$2799.55** CDW 90352

CDW is the #1 mail-order reseller of **Toshiba** products!

Satellite Pro 460CDT

- 166MHz Intel Pentium® processor with MMX technology
- 32MB EDO DRAM standard, expandable to 160MB
- 2.02GB hard drive
- 10X CD-ROM drive
- 12.1" active-matrix SVGA color display
- 33.6K bps internal data/fax modem

\$3659.16 CDW 90353



CDW

Honored by
PC Magazine

one of the



Top 100

Most
Influential
Companies

in the
computer
industry,
July 1997

CDW offers competitive business equipment leases

800-998-4239





**COMPUTER
DISCOUNT
WAREHOUSE**

The right price.
The right advice.

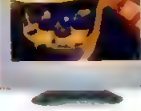
We offer you

“Get more than
just a great price.
Call today and get a
little empathy,
some free advice
and a free CDW
catalog.”



ViewSonic® G773

new!



17" color monitor
■ 17" SuperClear™ with Microfilter™
screen CRT, 16" viewable image size
■ 0.26mm dot pitch ■ Maximum
resolution: 1280 x 1024,
1024 x 768 at 8Hz

\$629.86 CDW 91076

PT75

■ 17" Super Contrast screen CRT, 16" viewable image size
■ 0.25mm dot pitch ■ Maximum resolution:
1600 x 1280; 1280 x 1024 at 8Hz

\$779.80 CDW 91079



Director 6 Multimedia Studio

For Windows 95 and NT
**Powerful tools for multimedia
and the web**



Director 6 Multimedia Studio gives you
the most advanced web authoring and
playback capabilities available. Create
Internet and hybrid CD+Internet
applications with new drag-and-drop
behaviors and live web authoring. With streaming
Shockwave, there's no waiting for the entire file to
download—even over small bandwidth connections!

Upgrade **\$479.57** CDW 84234

Full version **\$937.20** CDW 84233

Hardware, Software & Peripherals at DISCOUNT Prices!

NETWORKING PRODUCTS

Microsoft

Windows NT Server V4.0	
Upg + 5-client license CD	365.77
Upg + 10-client license CD	485.83
Comp upg + 5-client license CD	365.77
Comp upg + 10-client license CD	485.83
Server + 5-client license CD	729.14
Server + 10-client license CD	1006.40
Single-client license upg	15.52
Single-client license	28.96
Windows NT Workstation V4.0	
Version upg CD	129.52
Single-client upg	229.98
Full version CD	269.94

Novell

IntranetWare	
5-user CD	739.47
10-user CD	1324.67
25-user CD	2328.46
50-user CD	3305.47

Call for Novell IntranetWare upgrades.
IntranetWare for Small Business

1-user additional license	45.07
5-user additional license	218.23
Server with 5 licenses	598.63

Call for additional Novell IntranetWare
multi-user configurations.

3Com

Impact IQ ISDN modem external	249.85
3C509B TPO Ethernet III 10BT ISA	58.58
3C509B COMBO Ethernet III combo ISA	119.16
3C509B TPO Ethernet III coax ISA	63.45
3C905-TX Fast Ethernet XL 10/100 PCI	68.46
3C900-TPO Ethernet XL 10BT PCI	97.41
3C900-COMBO Ethernet XL PCI combo	117.55
3C589-TX Ethernet III LAN PC Card 10BT	129.68
3C520-TX Ethernet III 33.6 PC Card 10BT	24.12
OfficeConnect 4-port hub	69.35
SuperStack II Hub 750/112-port 10BT	349.14
OfficeConnect 5-port hub	11.72
SuperStack II Hub 24-port	85.58

Allied Telesys International

AT-2000T Plus 16-bit ISA bus adapter card	21.22
AUI/10BT slimline micro transceiver	33.64

3Com

FastHub 104T 4-port 100BTX hub	487.68
FastHub 108T 8-port 100BTX hub	758.28
FastHub 216T 100BTX Fast Ethernet hub	1839.45
2501 Ethernet dual serial router	1737.52
766 ISDN access router	609.89

COMPAQ

Netelligent 10BT PCI controller	79.43
Netelligent 10/100BTX PCI controller	98.57
Netelligent 5226 24-port Ethernet switch	2009.85

HEWLETT PACKARD

HP JetDirect 1500 24-port server	167.98
HP JetDirect 10/100BT	
print server card internal	389.92
HP JetDirect Ethernet 10BT	307.04
HP JetDirect EXPlus print server external	289.40
HP JetDirect EXPlus3 print server external	389.78

IBM

IBM PC Server 310	
5.200 32MB no hdd 8X CD	2098.89
5.200 32MB 2.1GB 8X CD	2465.91
IBM PC Server 315	
6.200 32MB no hdd 8X CD	2399.63
6.200 32MB 2.1GB 8X CD	2799.90
IBM PC Server 330	
6.200 32MB ECC optional hdd 8X CD	3739.20
6.200 32MB ECC optional hdd 8X CD	4247.09
6.200 32MB ECC 24x 250GB 8X CD	7668.88

Intel

EtherExpress PRO 100 PCI	79.98
NetPort Express PRO/100	364.23
Express 10/100 Fast Ethernet switch	2005.78
Express 10/100 Stackable 12-port hub	999.00

NETWORKING PRODUCTS

NETGEAR

10/100 Fast Ethernet PCI adapter	49.73
EN104 4-port 10BT slimline Ethernet hub	63.25
EN108 8-port 10BT slimline Ethernet hub	84.60
FE104 4-port 10BT Fast Ethernet hub	179.02
FE108 8-port 100BT Fast Ethernet hub	358.87

Seagate Software

NetBackup Communicator Std Edition	44.43
NetBackup Communicator Professional Edition	59.23

Backup Exec V7.0 for Windows NT	
Single-server edition CD	429.86
Enterprise edition CD	888.91
Desktop Management Suite V2.7	
50-user	1294.24
100-user	2194.39

DATA STORAGE

iomega

Zip drive 100MB parallel	149.95
Zip drive 100MB external SCSI	149.95
Zip drive 100MB internal SCSI	149.95
Jaz drive 1GB internal SCSI-2	299.95
Jaz drive 1GB external SCSI-2	399.95
Ditto drive 2GB internal	149.95
Ditto drive 2GB external	199.95
Ditto Dash Card	59.95
Ditto 3200MB Travan internal	194.49

HEWLETT PACKARD

HP Colorado T3000 3.2GB TBU	186.98
HP Colorado 14000s Travan internal	369.75
HP Colorado 14000s Travan external	449.46

Quantum

Fireball ST 1.6GB Ultra ATA	179.21
Fireball ST 2.1GB Ultra ATA	198.87
Fireball ST 3.2GB Ultra ATA	235.52
Fireball ST 4.3GB Ultra ATA	279.32
Fireball ST 6.5GB Ultra ATA	384.93

Seagate

1.2GB EIDE	149.86
2.1GB Fast ATA-2	179.29
2.1GB Ultra SCSI	249.41
2.5GB Fast ATA-2	209.16
4.5GB Ultra SCSI	909.63
9.1GB Ultra SCSI	1109.87

INPUT DEVICES

Alps GlidePoint Wave keyboard/touchpad	69.64
Alps GlidePoint Windows 95 keyboard	98.10
Capeo QV 300 digital camera	668.34
Connectix Color QuickCam V2.0	218.62
Epson PhotoPC digital camera	345.99
Epson PhotoPC 500 digital camera	499.00
Epson ActionScanning System II	193.34
Kensington Expert Mouse 636	79.00
Hewlett Packard ScanJet 5a	199.58
Hewlett Packard ScanJet 5p	297.08
Hewlett Packard ScanJet 4cse	695.77
Kensington Mouse-in-a-Box	27.29
Kensington Expert Mouse V5.0 PS/2	85.63
Kensington Orbit	51.56
Kodak DC50 Zoom Digital Camera	699.00
Kodak DC120 Zoom Digital Camera	999.00
Logitech Cyberman II game controller	89.25
Logitech PageScan Color Pro	269.18
Microtek Color PageWiz compact scanner	158.21
Microtek ScanMaker E3 color flatbed	174.56
Microtek ScanMaker E6 std color flatbed	289.47
Logitech Cyberman II game controller	139.41
Nikon Coolpix 300 digital camera	674.04
Play Snappy video still capture	139.15
Ricoh RDC-2 digital camera	329.00
UMAX Astra 600P scanner	209.52
UMAX Astra 600S scanner	239.14
UMAX Astra 1200S scanner w/PhotoDeluxe	449.08
Visiometer PaperPort mx scanner	179.98
Visiometer PaperPort ix scanner	189.37
Visiometer PaperPort Siro scanner	299.00

MONITORS

MAG Innovation 410V2 14" 0.28mm	209.50
MAG Innovation 510V2 15" 0.28mm	289.44
MAG Innovation 710V2 17" 0.28mm	495.26
Magnavox MB4010 14" 0.28mm	219.86
Magnavox MV5011 15" 0.28mm	277.56
Magnavox MB7000 17" 0.28mm	509.18
NEC MultiSync E500 15" 0.25mm	374.91
NEC MultiSync E700 17" 0.25mm	659.18
NEC MultiSync E1100 21" 0.25mm	1359.09
NEC P750 17" 0.25mm	849.20
NEC P1150 21" 0.28mm	1498.63
Princeton E500 15" 0.28mm	267.44
Princeton E700 17" 0.28mm	469.36
Princeton E900 19" 0.26mm	849.20
Samsung SyncMaster 500a 15" 0.28mm	279.00
Samsung SyncMaster 700a 17" 0.28mm	499.00
Sony Multiscan 1000x 15" PnP 0.25mm	329.00
Sony Multiscan 2000x 17" PnP 0.25mm	607.81
Sony Multiscan 3000x 20" PnP 0.30mm	1398.75
ViewSonic E641 14" 0.28mm	209.68
ViewSonic E655 15" 0.28mm	289.59
ViewSonic G771 17" 0.27mm	556.28
ViewSonic P615 21" 0.25mm	1549.27

PC CARDS

3Com LAN PC Card combo	174.13
3Com 33.6 10BT LAN-modem	255.25
3Com 33.6 10BT LAN-modem combo	299.12
3Com 32-bit Fast Ethernet XL CardBus	147.57
Hayes ACCURA 33.6 10BT Ethernet	299.91
Hayes ACCURA 56K	179.79
Hayes OPTIMA 56K	199.14
Intel EtherExpress PRO/100	
16-bit PC Card adapter	159.61
Intel EtherExpress PRO/100	
32-bit Card Bus adapter	179.79
Motorola Manner 33.6	359.16
Motorola MobileSURF 56K	179.03
New Media PC Card psychok adapter	59.06
Practical Peripherals 33.6	149.46
Practical Peripherals 56K Flex cellular	179.91
Simple 33.6 cellular	149.19
Simple 33.6 Communicator w/SimpleJack	145.42
Simple 56K Communicator	155.69
U.S. Robotics Ethernet adapter w/XJACK	109.00
U.S. Robotics 33.6 cellular	239.00
U.S. Robotics 33.6 cellular w/XJACK	229.85
U.S. Robotics 33.6 w/XJACK	219.00
U.S. Robotics 56K w/XJACK	229.20
Xircor 33.6	148.95
Xircor 33.6 Ethernet 10BT	307.03
Xircor 33.6 Ethernet combo	335.78

MODEMS

ACCURA 33.6K faxmodem internal	95.61
ACCURA 33.6K faxmodem external	119.41
OPTIMA 336 Business Modem internal	169.02
OPTIMA 336 Business Modem external	179.91
ACCURA 56K internal	139.29
ACCURA 56K external	169.71
ACCURA 56K speakerphone internal	177.98
ACCURA 56K speakerphone external	165.07
OPTIMA 56K internal	267.21
OPTIMA 56K external	289.59
ACCURA ISDN	249.45

MOTOROLA

ModemSURF 56K internal	145.22
ModemSURF 56K external	159.92
VoiceSURF 56K internal	159.62
VoiceSURF 56K external	179.11
BitSURF Pro EZ ISDN	259.86

HEWLETT PACKARD

56K data/fax modem internal	129.97
56K data/fax modem external	154.76

MODEMS

Robotics

Sportster Series	
Winmodem V.34 33.6 internal w/fax	78.24
V.34 33.6 internal w/fax	114.38
V.34 33.6 external w/fax	139.38
Voice V.34 33.6 internal w/fax	139.07
Voice V.34 33.6 external w/fax	159.90
56K x2 internal	197.99
56K x2 external	217.99
56K x2 Voice internal	217.99
56K x2 Voice external	237.99
56K Winmodem	177.99
ISDN 128k terminal adapter	226.93
Courier Series	
V.34 33.6 internal w/fax	215.81
V.34 33.6 external w/fax	236.73
56K x2 internal	229.55
56K x2 external	264.99
I-modem ISDN V.34 faxmodem internal	239.02
I-modem ISDN V.34 faxmodem external	279.63
DataBurst ISDN U interface external	208.25
DataBurst ISDN S/T interface external	239.39

3COM

33.6 voice/SVO internal	109.91
V.34 Plus 33.6 faxmodem internal	78.80
V.34 Plus 33.6 faxmodem external	99.22
56K internal	139.29
56K external	159.86

PRINTERS

Canon

BJ-300 monochrome	259.78
BJC-100	299.00
BJC-250	179.00
BJC-620	299.00
BJC-4304 Photo	239.00
BJC-4550	499.00

EPSON

FX870	289.18
LO670	349.85
LO2070	364.00
LY300	169.17
Stylus Color 400	199.00
Stylus Color 600	299.00
Stylus Color 800	399.00
Stylus Color 1520	799.00
Stylus Color 3000	1999.00
Stylus Photo	499.00

HEWLETT PACKARD

HP DeskJet 340 portable inkjet printer	298.80
HP DeskJet 672C color printer	199.00
HP DeskJet 694C color printer	299.00
HP DeskJet 8200Cse color printer	249.00
HP DeskJet 1000Cse color printer	499.00
HP LaserJet 58e printer	1048.00
HP LaserJet 6Lse printer	399.00
HP LaserJet 6MP printer	679.85
HP LaserJet 6Pse printer	799.00
HP OfficeJet 570 multi-function	549.00

LEXMARK

Color Jetprinter 1000	139.99
Color Jetprinter 2030	185.24
Color Jetprinter 3000	239.50
Color Jetprinter 7000	404.45
Optra E+	385.98
Optra S 1250	1039.17
Optra S 1650	1259.32
Optra S 2450	2189.10
Optra SC 1275	3916.00

OKIDATA

ML320 Turbo	318.59
ML380 Turbo	338.10
Okupage 4w	189.00
Okupage 6e	299.00
Okupage 16n	867.65
OL6008	299.00

800-998-4239

Order from CDW today and use it tomorrow

a rare sales too. it's called objectivity.



pcANYWHERE 32 V8.0 For Windows 95 and NT

Symantec pcANYWHERE 32 V8.0 gives you optimal 32-bit support for both Windows 95 and Windows NT. It also includes versions of pcANYWHERE for Windows V3.1 and DOS so you can run pcANYWHERE on all the platforms you use. pcANYWHERE supports the latest, fastest hardware to optimize your connection time.

Host and remote	\$70 rebate! \$65.67*	CDW 93317
Host only	\$78.75	CDW 93320
Remote only	\$89.78	CDW 93322

*After \$70 mail-in manufacturer rebate. Restrictions apply—please call for details.

Office 97 Professional Edition

Office 97 Professional Edition upgrade

with Bookshelf Basics **\$268.30** CDW 78404

Office 97 Professional Edition

with Bookshelf Basics **\$529.80** CDW 78403

Office 97 Professional Edition upgrade

with Bookshelf Basics and IntelliMouse **\$294.51*** CDW 78405

Standard Edition upgrade **\$179.13*** CDW 78407

Standard Edition **\$445.21** CDW 78406

Small Business Edition competitive upgrade **\$184.29*** CDW 82648

Small Business Edition **\$449.52** CDW 82847

*After \$40 mail-in manufacturer upgrade rebate. Restrictions apply. Offer valid while supplies last.

Microsoft

More than 10 years of experience in the software business.

Office 97



SyncMaster 700s

17" color monitor

17" diagonal flat square tube,
15.7" viewable image size
0.28mm dot pitch
Maximum resolution:
1280 x 1024 at 60Hz
Invar shadow mask
3-year warranty
with advance replacement

Shown with optional
multimedia/Internet
upgrade kit

\$499.00

CDW 85571

\$579.31

CDW 85573

CDW® carries more than 20,000 products! If you don't see it, Call!

COMPUTERS

TOSHIBA

Libretto mini-notebooks	
50CT 5/15 16MB 72MB 8 1" active	1929.45
Satellite & Satellite Pro notebooks	
220CD 5/133 16MB 1.34GB	
12.1" dual 10X CD	1899.13
440CDX 5/133 MMX 16MB 1.34GB	
12.1" dual 10X CD	2350.54
440CDT 5/133 MMX 16MB 1.34GB	
12.1" active 10X CD	2799.55
480CDT 5/166 MMX 32MB 2.02GB	
12.1" active 10X CD	3659.16
Portage notebooks	
300CT 5/133 MMX 32MB 1.5GB	
10.4" active	3308.46
500CDT 5/120 16MB 1.29GB	
12.1" active 10X CD	1996.94
660CDT 5/150 16MB 1.2GB	
12.1" active 10X CD	3099.63
Terra notebooks	
510CDT 5/133 16MB 2.1GB	
12.1" active 10X CD	2659.78
520CDT 5/166 MMX 32MB 2GB	
12.1" active 10X CD	4159.45
500CDT 5/166 MMX 32MB 2GB	
12.1" active 10X CD	4579.17
730XCDT 5/150 MMX 16MB 2GB	
12.1" active 10X CD	3499.77
740CDT 5/166 MMX 16MB 3GB	
13.3" active 10X CD	4659.23
740CDT 5/166 MMX 16MB 3GB	
13.3" active 10X CD	4849.62
Infinite mini-towers	
7181 5/166 MMX 32MB 2.38GB 12X CD	1649.89
7201 5/200 MMX 32MB 3GB 12X CD	1989.24
Equium desktops	
5180D 5/166 MMX 32MB 2.1GB 12X CD	1418.82
5200D 5/200 MMX 32MB 2.38GB 12X CD	1549.64
6200D 6/200 32MB 3GB 12X CD	2119.60
Equium mini-towers	
6200M 6/200 32MB 4.3GB 12X CD	2479.47
6260M 266MHz Pentium II 32MB	
3.7GB 16X CD	2589.07

ACER

TEXAS INSTRUMENTS

Extensa notebooks	
610CD 5/150 16MB 1.4GB	
11.3" dual 10X CD	1964.67
610CDT 5/150 16MB 1.4GB	
11.3" active 10X CD	2549.84
660CD 5/166 MMX 16MB	
1.35GB 12.1" dual 10X CD	2099.55
660CDT 5/166 MMX 16MB	
2.1GB 11.3" active 10X CD	3179.04
TravelMate notebooks	
TM7000 5/166 MMX 32MB 2GB	
12.1" active 10X CD	4299.59
TM7000NT 5/166 MMX 32MB 3GB	
12.1" active 10X CD	4949.89
AST	
Ascentia notebooks	
A60+ 5/150 16MB 1.44GB	
12.1" active 10X CD	2499.93
A70+ 5/150 MMX 16MB 1.44GB	
12.1" active 10X CD	2887.70
P70 5/150 MMX 32MB 2.1GB	
12.1" active 10X CD	3299.73
P80 5/166 MMX 32MB 3GB	
12.1" active 10X CD	3739.04
Bravo LC 8233 Series desktops	
233MHz Pentium II 32MB 2GB Win95	2099.23
233MHz Pentium II 32MB 2GB WinNT	2197.23
Bravo MS Series desktops	
5/166 MMX 32MB 2GB 16X CD	1819.87
5/200 32MB 2GB 16X	1549.10
5/200 32MB 3GB 16X CD	1487.26
5/200 MMX 32MB 3GB 16X CD	1896.89
5/200 MMX 32MB 3GB 16X CD	1799.25

COMPUTERS

AST

Bravo MS-T Series mini-towers	
5/166 32MB 3GB 16X CD	1625.72
5/200 32MB 3GB 16X CD	1564.09
5/200 32MB 3GB 16X CD	1649.08
5/200 MMX 32MB 3GB 16X CD	1779.77
5/200 MMX 32MB 3GB 16X CD	1879.98
6/200 32MB 2.5GB 8X CD	1866.33
Armada notebooks	
1530MD 5/133 MMX 16MB 1.4GB	
12.1" dual 10X CD	2499.00
1550MDT 5/133 16MB 1.4GB	
12.1" active 10X CD	2999.00
1580MDT 5/150 MMX 16MB 2.1GB	
12.1" active 10X CD	3499.00
4130T 5/133 16MB 1.08GB 11.8" active	2497.23
4131T 5/133 16MB 1.4GB 12.1" active	2849.00
7710MT 5/166 MMX 16MB 1.6GB	
12.1" active	3099.00
7730MT 5/166 MMX 32MB 2.1GB	
12.1" active	4399.00
7750MT 5/166 MMX 32MB 2.1GB	
12.1" active	4999.00
Desktop 2000 desktops	
5133/1200 5/133 16MB 1.2GB	979.00
5133/2500 5/133 16MB 2.5GB	1089.00
5166X/2100 5/166 MMX 16MB 2.1GB	1199.00
5166X/3200 5/166 MMX 16MB 3.2GB	1309.00
5200X/2100 5/200 MMX 16MB 2.1GB	1389.00
5200X/3200 5/200 MMX 3.2GB	1399.00
5233X/3200 5/233 MMX 32MB	
3.2GB 16X CD	1949.00
Desktop 2000 mini-towers	
5166X/3200 5/166 MMX 16MB	
3.2GB 16X CD	1619.00
5200X/2500 5/200 MMX	
32MB 3.2GB 16X CD	1799.00
6200/2500 CD 6/200 32MB 2.5GB 8X CD	2109.00
Desktop 4000 desktops	
5166X/2400 5/166 MMX 16MB 2.4GB	1389.00
5166X/3200 5/166 MMX 32MB 3.2GB	1599.00
6233X/2500 5/233 MMX Pentium II	
32MB 2.5GB 8X CD	2319.00
5200X/2400 5/200 MMX 32MB 2.4GB	1689.00
6230X/3200 5/200 MMX 32MB 3.2GB	1759.00
Desktop 4000 mini-towers	
5166X/3200 5/166 MMX	
32MB 3.2GB 16X CD	1799.00
Desktop 6000 desktops	
6233X/2150/PDS 233MHz Pentium II	
32MB 2.15GB	2629.00
6266X/4200/CDS 266MHz Pentium II	
32MB 4.2GB 8X CD	3179.00
Desktop 6000 mini-towers	
6200/4200/PDS 6/200 64MB 4.2GB	3099.00
Presario desktops	
2200 5/180 16MB 1.6GB 8X CD	799.00
Presario mini-towers	
4504 5/200 16MB 1.6GB 16X CD	999.00
4814 5/233 MMX 32MB 6.5GB 24X CD	1999.00
4824 5/233 MMX 32MB 6.5GB	
24X CD omega Zip drive	2399.00

HEWLETT PACKARD

HP OmniBook 800 Series notebooks	
800CT 5/166 MMX 16MB 2GB 10.4" active	3679.68
HP OmniBook 5700 Series notebooks	
5/166 MMX 16MB 1.86GB 12.1" active	3587.52
5/166 MMX 16MB 1.86GB 12.1" active	4039.53
5/166 MMX 16MB 1.86GB 12.1" active	4098.82
5/166 MMX 32MB 2.79GB 12.1" active	4574.01

COMPUTERS

HEWLETT PACKARD

HP Vectra VL Series 3 PC desktops	
5/166 16MB 1.6GB	1166.30
5/166 MMX 16MB 2.5GB 8X CD	1377.09
5/200 MMX 32MB 2.5GB 8X CD	1568.83
5/233 MMX 16MB 2.5GB	1598.12
HP Vectra VL Series 5 PC mini-towers	
5/133 16MB 1.6GB	1219.44
5/166 16MB 2.5GB	1229.56
5/166 MMX 16MB 2.5GB 8X CD	1439.22
5/233 MMX 32MB 4GB	1689.78
HP Vectra VE Series 3 PC desktops	
5/166 16MB 1.6GB	1038.97
5/200 16MB 1.6GB	1048.60
HP Vectra 500 Series desktops	
525CD 5/133 16MB 1.2GB 8X CD	999.49
520MCx 5/166 16MB 1.6GB 16X CD	1327.64
HP Vectra 500 Series mini-towers	
525CD 5/166 16MB 1.6GB 16X CD	1234.78
525MCx 5/166 MMX 24MB 2.5GB 16X CD	1549.65
525CD 5/200 MMX 24MB 2.5GB 16X CD	1588.65
525MCx 5/200 MMX 32MB 2.5GB 16X CD	1936.70
HP Brio Series mini-towers	
5/166 MMX 16MB 2.1GB	999.53
5/166 MMX 16MB 2.1GB 16X CD	1379.29
5/200 MMX 16MB 2.1GB	1154.35
5/200 MMX 32MB 2.1GB 24X CD	1635.54
5/233 MMX 32MB 4GB 24X CD	1869.90
5/233 MMX 32MB 6GB 24X CD	2117.37
HP NetServer E40 Series towers	
6/180 16MB no hdd 8X CD	
10/100 Ethernet	1719.00
6/180 16MB 2.1GB 8X CD 10/100 Ethernet	1999.58
6/200 32MB 2.1GB 8X CD 10/100 Ethernet	2294.17
ThinkPad notebooks	
380 5/150 16MB 1.08GB 12.1" dual	1899.46
380D 5/150 16MB 1.35GB	
12.1" dual 8X CD	1999.50
380D 5/166 MMX 16MB 2.1GB	
12.1" active 8X CD	3069.78
560 5/133 8MB 2.1GB 11.3" dual	1699.89
560 5/133 8MB 2.1GB 12.1" active	2849.32
560E 5/150 MMX 16MB 2.1GB 11.3" dual	2599.86
560E 5/150 MMX 16MB 2.1GB	
12.1" active	4186.26
760ED 5/133 16MB 2.1GB	
12.1" active 8X CD	3739.72
760E 5/150 16MB 2.1GB 12.1" active	3578.40
760XL 5/166 MMX 16MB 2.1GB	
12.1" active	3768.88
760XL 5/166 MMX 32MB 2.1GB	
12.1" active	4084.04
760XD 5/166 MMX 32MB 3GB	
12.1" active 8X CD	4679.37
765L 5/166 MMX 32MB 3GB 13.3" active	5094.39
765D 5/166 MMX 32MB 2.5GB	
13.3" active 8X CD	5489.91
Active Series mini-towers	
C3E 5/233 MMX 32MB 4.2GB 16X CD	1039.05
C3D 5/233 MMX 32MB 4.2GB 8X CD	2699.00
5/200 MMX 32MB 4.2GB 16X CD	1939.05
5/200 MMX 32MB 4.2GB 16X CD	2299.00
5/200 MMX 48MB 6.4GB 24X CD	2899.00
PC300GL Series desktops	
5/166 16MB 1.2GB	999.63
5/166 16MB 2.5GB	1109.18
5/166 16MB 2.5GB 16X CD	1366.50
5/166 MMX 32MB 2.5GB	1419.28
PC300XL Series desktops	
233MHz Pentium II 32MB 2.5GB 16X CD	2296.14
233MHz Pentium II 32MB 2.5GB	1999.36
266MHz Pentium II 32MB 4.2GB 16X CD	2659.12
266MHz Pentium II 32MB 4.2GB 16X CD	2369.24

COMPUTERS

FUJITSU

LifeBook 500 Series notebooks	
555TX 5/150 MMX 16MB 2GB	
12.1" active 10X CD	3499.00
565TX 5/166 MMX 32MB 2GB	
12.1" active 20X CD	4299.00
LifeBook 500 Series notebooks	
435T 5/133 16MB 1.3GB 12.1" active	2799.00
655TX 5/150 MMX 16MB 1.3GB	
12.1" active	3799.00
VIASION	
VisionBook Plus Series notebooks	
4140 5/133 16MB 1.4GB	
12.1" dual 10X CD	1799.00
4150x 5/150 MMX 16MB 1.4GB	
12.1" dual 10X CD	2499.00
4360x 5/166 MMX 16MB 1.4GB	
12.1" active 10X CD	3499.00
VisionBook Pro Series notebooks	
7340 5/133 MMX 16MB 1.4GB	
12.1" active 10X	3199.00
7360 5/150 MMX 16MB 2.1GB	
12.1" active 10X CD	4499.00
7560 5/166 MMX 16MB 3GB	
13.3" active 10X CD	4999.00
VisionBook Elite Series notebooks	
8560 5/166 MMX 16MB 2.1GB	
13.3" active 10X CD	4799.00

HANDHELD PCs

Casio Casiopea A-11 4MB	484.13
Hewlett-Packard 300LX Palmtop PC 4MB	477.34
Hewlett-Packard 320LX Palmtop PC 4MB	499.14
Philips Velo 1 4MB	739.99
U.S. Robotics PalmPilot Personal	286.99
U.S. Robotics PalmPilot Professional	377.99

CDW® DIRECTORY

PC sales	800-998-4239
Mac sales	800-291-4239
Corporate sales	800-280-4239
Corporate software sales	800-294-4239
Government and Education sales	800-615-4239

CDW® TELEPHONE HOURS

Sales	Monday-Friday 9 a.m.-6 p.m. CT
Tech Support for Customers	Saturday 9 a.m.-5 p.m. CT
Monday-Friday 9 a.m.-5 p.m. CT	Saturday 9 a.m.-5 p.m. CT

BUT WITH CONFIDENCE

CDW® IS A NASDAQ LISTED COMPANY

TICKER SYMBOL: CDW D B B rated S&P One 10-762-762

Check card charges are not submitted until time of shipment.

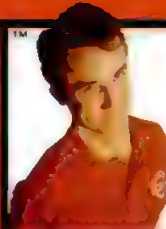
For your protection we ship only to your credit card's verified billing address. Freight is calculated as the carrier's actual freight charge plus insurance and packaging material. The cost of insurance is 0.35% (0.0035) of the order total. Packaging materials will not exceed \$100 for single package shipments or \$600 for multi-package shipments. Before returning any product you must obtain an RMA number. Non-defective returns are subject to a restocking fee. Software, chips and other electronic components are not returnable. Allow 10 business days for shipping when paying by personal check. All pricing subject to change. For all prices, products and offers, CDW reserves the right to make adjustments due to changing market conditions, product discontinuation, manufacturer price changes, errors in advertisements or other extenuating circumstances. All trademarks and registered trademarks are the sole property of their respective owners.

Three reasons to choose CDW : price, advice and service



**COMPUTER
DISCOUNT
WAREHOUSE**

**The right price.
The right advice.**



**“Great prices,
superior service”**



**HEWLETT
PACKARD**

**HOT
BUY!**

**Includes HP Color
Kit, a \$35 value!**

HP DeskJet 340 Portable Inkjet Printer

**The printer that makes
anyplace your workplace!**

- Sharp 600 x 300 dpi monochrome output
- 3 ppm fast, high-quality black printing
- 2-4 mpp full color graphics ■ Parallel interface, 48KB input buffer ■ Streamlined, lightweight 4.3 lbs—fits easily into a briefcase ■ HP C2655A

\$279.28 CDW 60751



3Com

EtherLink III

- Connects at higher speeds more often ■ Quicker system response, faster data transfers—up to 46% faster than the competition ■ Plug and Play (PnP) compatible under Windows 95
- Cellular-ready (LAN+33.6 Modem only)
- Guaranteed compatibility with leading notebooks or your money back within one year of purchase ■ Lifetime warranty



LAN+33.6 Modem PC Card	\$255.25	CDW 85705
LAN+33.6 Modem PC Card-Combo	\$299.12	CDW 86725
LAN PC Card-TP	\$119.10	CDW 82825
LAN PC Card-Combo	\$174.13	CDW 81978
10/100 16-bit PC Card	\$169.09	CDW 87717
10/100 Card Bus adapter	\$147.57	CDW 87723



Xircom CreditCard Ethernet 10/100+Modem 56*

- Auto-negotiation of 10 and 100Mbps networks
- Flash upgradeable to future 56K ITU standard ■ Digital Shield* protects against high current digital phone lines
- Cellular upgradeable with optional cable, sold separately
- Global Access—international certification ■ Optional MiniDock* connector



CreditCard Ethernet 10/100+Modem 56 10T/100TX	\$324.13	CDW 88828
CreditCard Ethernet 10/100+Modem 56 w/ MiniDock 10T/100TX	\$319.08	CDW 88829
CreditCard Ethernet 10T/100-TX	\$157.39	CDW 78929
CreditCard Ethernet 10T, upgradeable to 100-TX	\$136.40	CDW 71046
CardBus Ethernet 10/100 32-bit adapter	\$157.39	CDW 77620
CreditCard Modem 33.6	\$148.95	CDW 75702

* With K56Flex technology, FCC regulations currently limit download speeds of service providers' modems to 33K bps

Robotics® The Intelligent Choice in Information Access

XJ1560 56K bps PC Card modem with XJACK connector

New x2™ Technology provides up to 56K bps download data speeds over standard analog phone lines (current regulations limit download speeds to 33K bps). More than 600 Internet service providers with 16 million subscribers support x2, including AOL, CompuServe and Prodigy.

- Built-in XJACK connector saves you cable carrying hassles ■ Smart Battery Saver allows notebook to work longer between battery charges ■ Digital Line Guard protects modem from high-voltage digital PAX lines ■ Intelligent Auto Install guides you through auto installation in a matter of minutes ■ Free easy-to-use data/fax software for Windows



\$229.21
CDW 87320

PC Card Solutions

56K Communicator

- Cellular ready (with optional direct connect cable)
- K56Flex ■ Connects 56K bps and V.34 33.6K bps
- 14.4K bps fax
- MNP10-EC cellular error control technology
- Voicemail and automated paging
- Includes Cheyenne BitWare for Windows and AOL

new!



\$155.89
CDW 85709

Every Simple Technology product is tested for 100% compatibility and is backed with a lifetime warranty.



www.simpletech.com

Removable Hard Drives



Each Simple Technology removable hard drive is pre-formatted with Ontrack Disk Manager (software included). Data transfer rate: 16.6Mbps. Guaranteed for one full year.

Model	1.44GB	Hard drive capacity	2.1GB	3.0GB
IBM ThinkPad 355, 360, 750, 755	\$229.86 87497	\$229.82 71582	\$797.14 88667	
IBM ThinkPad 760, C, CD, L, LD	\$229.86 87498	\$218.34 85087		
Toshiba T4700, T4800, T4850	\$368.75 87501			
Toshiba T700, T710, T720	\$368.75 87502	\$218.34 71588	\$889.17 88072	
NCR Solaan 3181 4/50, 3182 4/75	\$368.75 87499	\$218.34 71587	\$797.14 88668	
AT&T Globalnet 250	\$368.75 87500	\$218.34 71587	\$797.14 88669	
NEC Versa 2000, 4000	\$368.75 87500	\$228.27 82845		
NEC UltraLite, Versa E, V, M, P	\$368.75 87499	\$218.34 71587	\$797.14 88668	
Compaq LTE 5000, 5100, 5200, 5300, 5400	\$229.86 87498	\$229.80 71576	\$797.14 88665	



Simple TECHNOLOGY

Flash Cards



Digital "Film" for Your Digital Camera

ATA Flash PC Cards

4MB ATA Memory	\$61.06	86584
8MB ATA Memory	\$124.37	86580
12MB ATA Memory	\$149.51	86581
16MB ATA Memory	\$206.39	86583
32MB ATA Memory	\$349.11	73712

Compatible with Casio Cassiopeia-HPC, OV-300, OV-120A Canon Powershot 600, Epson PhotoPC 500, Kodak DC120, DC25, DC20, DC30, Minolta RD-75, Polaroid PDC 2000/40, Ricoh RDC-2, RDC-2E, NEC MobilePro

CompactFLASH

4MB Memory	\$61.06	72849
8MB Memory	\$119.97	72850
Flash card adapter	\$16.80	72851
Flash card adapter with 4MB	\$97.81	86653
Flash card adapter with 8MB	\$129.86	86654

Compatible with Canon Powershot 350, Kodak DC25, DC120



33.6 Communicator with SimpleJack™

- Direct-connect in-line RJ-11 phone connector ■ Flash upgradeable ■ 33.6K bps Data (V.34bis/V.FC) ■ 14.4K bps fax
- Cellular ready (with optional connector cord) ■ MNP10-EC
- TX-CEL 3 Voice recording (with integrated sound) ■ Includes Cheyenne BitWare for Windows

TX-CEL

\$145.42

CDW 75260

33.6 Communicator **HOT BUY!** **\$132.99** CDW 76429

Nobody does prices better than CDW

800-998-4239

www.simpletech.com

© 1998 Simple Technology, Inc. All rights reserved. Simple Technology is a registered trademark of Simple Technology, Inc.

file *Newfile.ex* is new because it doesn't appear in the "before" snapshot.

TIEN NGUYEN
Carrollton, Texas

PC MAGAZINE: The result file will also indicate whether a file was deleted: A deleted file will show up in the "before" snapshot but not in the "after" snapshot. If you add the /A switch to both DIR commands, your report will also include hidden and system files.

When installing software on a logical drive other than the one that contains the Windows directory, you will need to take snapshots of both drives and check both for changes. The snapshot files can be rather large, but a compression utility such as PKZIP should reduce them to a quarter of their original sizes.

This technique can also help solve problems, if you periodically store snapshots of your system's file structure. When a problem arises, just check to see what files have changed since your last snapshot.

The PC Magazine utility INCTRL 3 (available from PC Magazine Online) detects changes to the file system in much the same way. But it stores its snapshots in a space-conserving format, and it analyzes the results to report which files were added, deleted, or changed. It also tracks changes to the Registry, which is extremely important in Windows 95 and Windows NT.

The snapshot technique described here is

```
Comparing files BEFORE.TXT and AFTER.TXT
***** BEFORE.TXT
CONFIG SYS                216 06-06-96  5:00p
MODIFIED EX                9 07-07-96  9:00a
      5 file(s)           613 bytes

***** AFTER.TXT
CONFIG SYS                216 06-06-96  5:00p
MODIFIED EX               12 03-04-97  8:45a
NEW EX                   7 03-04-97  8:45a
      6 file(s)           623 bytes

*****
```

FIGURE 2: By comparing directory "snapshots" from before and after a new program installation, you can determine which files were added or changed.

most appropriate for systems running either just DOS or DOS plus Windows 3.x.

Look Busy, Here Comes the Boss

Here's how you can convert Windows 95's Minimize All Windows option into a "boss" key. This handy trick works for both Windows 95 and Windows NT 4.0.

Make your screen look busy. Run several work-related applications (Excel and cc:Mail, for example). Don't maximize any applications, and make sure that no window overlaps icons on the desktop.

Hit the *PrtSc* key to capture the screen to the Clipboard.

Run Paint (Start | Programs | Accessories | Paint) and paste the screenshot (Edit | Paste) into a new document. Answer "yes" if Paint asks if you want it to enlarge the bitmap.

Save the bitmap in your Windows directory and quit Paint.

Open the Display property sheet (Start | Settings | Control Panel | Display).

Select the wallpaper you've just created and click OK.

Open the Taskbar property sheet (Start | Settings | Taskbar) and enable the auto-hide option.

When you hear your boss coming, quickly move your mouse pointer to the Taskbar. Click the right mouse button on the empty Taskbar area and select Minimize All Windows.

PHIL KIM
via the Internet

PC MAGAZINE: What don't you want your boss to see? Perhaps you're updating your resume or checking your personal portfolio via the Internet. We'll assume your reasons are valid. This tip offers a quick way to clear your desktop even if you don't have your wallpaper set to a screen shot of a busy desk.

Note that any icons on your desktop will appear on top of the wallpaper, even when all windows are minimized. That's why you're advised not to let any window overlap a desktop icon. And you must not move any desktop icons after snapping the busy-desk screen shot, or that icon will appear twice. The Paint accessory in Windows 95 and Windows NT 4 is smart enough that you don't even have to launch the Display Properties dialog. Once you've saved your bitmap, simply choose Set as Wallpaper (Centered) from the File menu.

Finding a blank space to right-click can be difficult when the Taskbar is filled with buttons. You're better off using Ctrl-Esc, which activates the Taskbar (and Start menu), and Alt-M, which invokes the Minimize All Windows command. When the coast is clear, though, you will have to use the right mouse button to invoke the Undo Minimize All choice from the Taskbar's context menu. There's no keyboard equivalent.

Determining the Size of a Folder's Contents

The easiest way to determine the size of a folder and all its subfolders is to select the folder and use the Properties command under the File menu. This tells you the amount of the space occupied by that folder.

ADRIAN PANG
Richmond, B.C., Canada

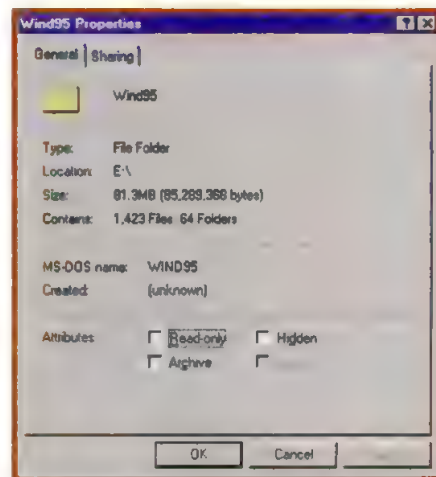


FIGURE 3: The Properties dialog for a folder in Windows 95 shows how many files and subfolders it contains, as well as the total file size.

PC MAGAZINE: Way back in the issue of September 26, 1995, User-to-User demonstrated a single complex DOS command for determining the total number of bytes occupied by all the files in and below a specified directory. The column of March 4, 1997, showed a batch file called Files.bat that can determine the actual amount of disk space occupied by those files. Under the FAT (DOS) and VFAT (Windows 95) file systems, disk space is allocated in whole clusters, so the amount of space occupied by a file is the file's stated size rounded up to the nearest whole cluster. Subtracting the stated size from the rounded-up size reveals how much space is wasted. This space can be significant, especially on large disks.

As this reader points out, under Windows 95 you don't need DOS commands to tell you the total size of all files in and below a folder; you can find that in the Properties dialog (Figure 3). You'll still have to use Files.bat to find the actual space used, including wasted space.

There is one thing you can't do with Files.bat. As several readers pointed out, despite what the March 4 column says, you can't run the file under DOS 6. The /V switch for the DIR command, which is essential to this batch file, wasn't introduced until DOS 7. Apologies to those who tried Files.bat under DOS 6 and were disappointed.



USA FLEX

The Best Prices
on Over 20,000
Computer Products

Satellite Pro 440CDX

- 133MHz MMX
- 16MB RAM
- 1.3GB HDD
- 10X CD-ROM
- 12.1" Display

Only
\$2299

EX1459

TOSHIBA

HP LaserJet 6Lse Printer

- hpmm
- 600dpi black laser printing

\$399.95

PR12310



NEW!

Robotics

US Robotics x2™ 56K Modem

Internal Model BND2130 **\$147.95***

External Model BND2131 **\$167.95***

*Price reflects mfr's \$50 rebate. Expires 10/4/97



Microsoft Office 97 Standard

Includes the following titles: Excel 97, Word 97, PowerPoint 97, and Outlook 97.

*Price reflects Microsoft \$40 version upgrade rebate. Price before rebate is \$219.95. **\$124.42**



Iomega Zip Drive

- Small, light and portable
- Store 100MB on each 3.5" disk

DR4602, Parallel DR1050, SCSI DR3278, Individer

MONITORS/GRAPHICS CARDS

14"	15"	17"
Power User (13.2 VHS) MTW08K \$189**	MAG DX700T (16 VHS) MON0512 \$649**	Viewsonic Optquest Q100 (18.4 VHS) MT145 \$1,040
Viewsonic Optquest V641 (13.2 VHS) MT141 \$209**	SONY 200SX (15.9 VHS) MON0415 \$689**	SAMSUNG 20GLS (18.7 VHS) MT1542 \$1,119
PRINCETON E040 (13.4 VHS) MT151 \$209**	PRINCETON E090 (18 VHS) MT1543 \$869	SONY 300SF (19 VHS) MON0418 \$1,529**
Philips/Magnavox MB4010 (13.2 VHS) MT157 \$219**	HITACHI 751 (18 VHS) MT1468 \$1,119**	ADI 66 (20 VHS) MT1464 \$1,269**
PRINCETON E050 (13.8 VHS) MT1516 \$269**	Viewsonic Optquest Q100 (18.4 VHS) MT145 \$1,040	HITACHI PRO 800 (20 VHS) MT1545 \$1,399
Viewsonic Optquest V655 (13.8 VHS) MT1494 \$299**	SAMSUNG 20GLS (18.7 VHS) MT1542 \$1,119	Viewsonic P1813 (20 VHS) MT1455 \$1,659**
Viewsonic E655 (13.8 VHS) MT1411 \$319**	SONY 300SF (19 VHS) MON0418 \$1,529**	SAMSUNG 21GLS (19.7 VHS) MT1543 \$1,549
NBC E500 (13.8 VHS) MT1547 \$369**	ADI 66 (20 VHS) MT1464 \$1,269**	
Power User (15.9 VHS) MT1178 \$469**	HITACHI PRO 800 (20 VHS) MT1545 \$1,399	
PRINCETON E070 (15.8 VHS) MT1514 \$469**	Viewsonic P1813 (20 VHS) MT1455 \$1,659**	
Viewsonic G771 (16 VHS) MT153 \$599**	SAMSUNG 21GLS (19.7 VHS) MT1543 \$1,549	

*Based on mfr's \$50 mail-in rebate

HERCULES

T2312EDO Terminator 4D PCI 2MB \$99**
T2314EDO Terminator 4D PCI 4MB \$129**
T2312EDO Terminator 64 PCI 2MB \$79**

PLAY

Snappy Video Capture \$189**

ATI

Video Xpression+ 2MB \$99**
3D Xpression+ PCI2TV, 2MB \$139**
3D Pro Turbo PCI2TV, 4MB \$199**

CREATIVE LABS

GBMA302 Graphics Blaster MAX2 \$79**
GBMA334 Graphics Blaster MAX34 \$99**

MEGAHERTZ

56K x2 with XJack DMD2771 \$229**
33.6 with XJack Cellular capable DMD2319 \$229**
33.6 Modern 10Base-T with XJack DMD2319 \$209**
10Base-T with XJack (X) 10BT/DOCI763 \$109**
10Base-T (cc 10 BT) DDC1337 \$109**

PRACTICAL PERIPHERALS

Internal 56K x2 DMD2416 \$139**
Internal 56K K56Flex DMD2537 \$139**
External 56K x2 DMD2415 \$165**
External 56K K56Flex DMD2538 \$165**

HAYES

Accura 33.6 External DMD2440 \$119**
Hayes 56K K56Flex External DMD2526 \$189**
Hayes 56K K56Flex External DMD2525 \$139**

PC CARDS

BOCA
Boca M56 (External) K56Flex DMD2472 \$149**
Boca M56 (Internal) K56Flex DMD2471 \$129**

US ROBOTICS

Sportster 33.6 Internal BND2138 \$89**
Sportster 33.6 External BND2139 \$119**
Sportster 56K Internal BND2130 \$147**
Sportster 56K External BND2131 \$167**

Courier V. Everything

Internal DMD1649 \$229**
External DMD1650 \$249**

*Price reflects mfr's \$50 mail-in rebate offer valid 7/1/97 - 10/4/97

**Price reflects a mfr's \$20 mail-in rebate offer valid 8/3/97 - 10/4/97

PRINTERS...LASER/INK JET/DOT MATRIX

HP PRINTERS

Deskjet 340C PR11112 \$299**	OkiPage 4W (Windows Only) PR11702 \$199**
Deskjet 672C PR12302 \$199**	O6000 PR11418 \$299**
Deskjet 694C PR12125 \$299**	ML320 PR11771 \$319**
Deskjet 820C PR11480 \$249**	ML321 Turbo PR11772 \$459**
Deskjet 870C PR11792 \$399**	ML590 PR11302 \$439**
Deskjet 1600C PR11386 \$1349**	ML591 PR11303 \$589**
Laserjet 5se PR12268 \$1049**	
Laserjet 6L PR12310 \$399**	
Laserjet 6P PR12301 \$799**	
Laserjet 6MP INP0975 \$999**	
Officejet 570 color 4-in-1 PR12303 \$549**	

EPSON

DPX-5000+/80000 \$1579**/2499**	Color Jetprinter 2050 PR1129 \$199**
PR11695/PR11694 \$199**	2300/2381 Plus Dot Matrix Printer \$319**/439**
Stylus Color 400 PR12121 \$199**	PR12328/PR12329 \$319**/439**
Stylus Color 600 PR12126 \$299**	2390/2391 Plus Dot Matrix Printer \$389**/469**
Stylus Color 800 PR12127 \$399**	PR12340/PR12345 \$389**/469**
Stylus 1520 PR12430 \$799**	4079 Plus PR11318 \$269**
Stylus Color 3000 (PCI) PR12407 \$199**	4039 10 Plus PR11256 \$299**
Stylus Color Photo PR12380 \$499**	Optara B Plus PR11421 \$899**

BROTHER

HL-720 (Windows Only) PR11689 \$299**	PR11422/PR11699 \$1599**/2199**
HL-730DX (Window & DOS) PR11752 \$329**	Optara C PR11423 \$429**
HL-760 (1200x600) PR12043 \$399**	Optara S 1250 12ppm PR12345 \$1019**
HL-1060 (10ppm) PR12042 \$699**	Optara S 2450 24ppm PR12346 \$1799**
MFC-690 (thermal) PR11488 \$269**	Optara N-240/Optara N-245 w/16MB RAM \$2799**/3299**
MFC-1950+ (ribbon) PR11487 \$399**	
MFC-4550 (laser) PR11715 \$769**	
MFC-6550MC (laser) PR11716 \$999**	

NOTEBOOK COMPUTERS

IBM ThinkPad

3000 P150MMX 2.1GB, 16MB, RX, 12.1" TFT CP4 \$2999**
3000 P150MMX 2.1GB, 16MB, 12.1" FIRST CP4619 \$2099
3000 P160MMX 2.1GB, 16MB, 8-20X, 12.1" FIRST CP4620 \$2589
3000 P160MMX 4GB, 16MB, 8-20X, 12.1" TFT CP4621 \$3639
560 P133 2.1GB, 8MB, 11.5" DSTN CP4220 \$1699
760XD P160MMX 4GB, 32MB, RX, 12.1" VGA TFT CP4435 \$4879

*While supplies last

ACER

6100C P150 1.4GB, 16MB, 10X CD, 11.5" DSTN CP4934 \$1799
6100CT P150 1.4GB, 16MB, 10X CD, 11.5" TFT CP4935 \$2299

COMPAQ Armada Series

4150 P150MMX 1.4GB, 16MB, 10X, 21" CSTN CP5293 \$2999
4160T P160MMX 2.0GB, 16MB, 10X, 12.1" TFT CP5294 \$3999
4150MMX P150MMX 1.4GB, 16MB, 33.6, 10X, 12.1" DSTN CP5292 \$2499
4150MMX P150MMX 2.1GB, 16MB, 33.6, 10X, 21" TFT CP5295 \$3499



INSTANT \$20 off
this Targus leather bag with purchase of any notebook computer

MULTIMEDIA/CD-ROM

CREATIVE LABS	PANASONIC	2X/6X CD-EasyWriter External
Blaster CD 24X EX7967 \$149**	Portable 4X CD-ROM Drive DR4853 \$299**	DR5747 \$549**
Sound Blaster AWE64 Gold EX7684 \$199**	Portable 4X CD-ROM Drive with Sound Card and Speakers DR4940 \$399**	8X CD-ROM Drive Internal DR5208 \$199**
Sound Blaster AWE64 Value EX7814 \$99**	Portable 8X CD-ROM Drive DR5651 \$399**	8X CD-ROM Drive External DR5429 \$299**
Sound Blaster 16 Basic EX7961 \$89**	24X CD-ROM Atapi EIDE Internal Drive DR6620 \$149**	
Creative PC-DVD DR6307 \$499**	24X CD-ROM SCSI Int. Drive DB6619 \$219**	

DESKTOP SYSTEMS

IBM 300GL SERIES	USA FLEX MINITOR SYSTEMS w/512K CACHE
P160MMX 32MB, 2.5GB, WIN-95 CP54111 \$1299	Flex Special 1600-PR116, 16MB, 2.5GB, AMB/AD, 16X CD CP5413 \$999
P160MMX 16MB, 2.5GB, WIN-95 CP5035 \$1179	Flex Performer 6386-PR200 32MB, 4GB, AMB/AD, 20X CD CP5414 \$1399
P200 32MB, 2.5GB, WIN-95 CP5034 \$1299	Flex Ultra Performer 6386-PR233 32MB, 4GB, AMB-WRAM, 20X CD CP5415 \$1849
P200MMX 32MB, 2.5GB, 16X CD-ROM, WIN-95 CP5033 \$1599	CyberNet 15" Monitor & Printer P200MMX 32MB, 2GB, 2MB/4D, 20X CD B4349 \$1999

Full Line of IBM Monitors Available!

NEW COMPAQ DESKPRO SERIES

DeskPro 2000 DT P160MMX 16MB, 2.1GB CP5248 \$1199	Basic Workstation & 17" Monitor P160, 32MB, 2GB, 16MB/4D, 10X CD EX4345 \$1299
DeskPro 2000 MT P160MMX 32MB, 2.1GB CP5254 \$1619	Business Workstation & 17" Monitor P200MMX 32MB, 4GB, 2MB/128-bit, 20X CD B4344 \$1899
DeskPro 2000 DT P200MMX 16MB, 2.1GB CP5252 \$1389	
DeskPro 2000 MT P200MMX 32MB, 2.1GB CP5247 \$1789	
DeskPro 4000 DT P160MMX 16MB, 2.1GB CP5259 \$1399	
DeskPro 4000 DT P200MMX 32MB, 2.1GB CP5256 \$1679	
DeskPro 4000 DT P243MMX 32MB, 3.2GB, 16X CD CP5253 \$2129	

Compaq & HP models do not include monitor unless otherwise stated

DIGITAL IMAGING

SONY	MICROTEK
Digital Mavica MVE-PD5 Camera N6546 \$499	Scanmaker E3 Flatbed Scanner IN5573 \$199**
DSC-F1 Digital Zoom Camera N6191 \$599**	Scanmaker E6 Flatbed Scanner IN5593 \$299**
	Scanmaker E6 Pro Flatbed Scanner IN5594 \$329**
KODAK	UMAX
DC20 Digital Camera N6080 \$199**	Astra 600P Flatbed Scanner N6253 \$149**
DC50 Digital Zoom Camera N6064 \$499**	Astra 600S Flatbed Scanner NP1145 \$169**
DC120 Digital Zoom Camera NP1132 \$799**	MDX 8000 Digital Camera N6251 \$479**
VIVITAR	
Vivitar 2000 Digital Camera N6357 \$229	

IBM LAPTOP 380E

• 150MHz Pentium w/ MMX	HEWLETT-PACKARD PALMTOP 320LX
• 2.1GB Hard Drive	• 60x3.5" 2400dpi Scanner
• 16MB RAM	• AMB (P4970)
• 12.1" FSTN VGA Color Display	\$569
	3000X/2.1GB (P4971) \$469

EPSON Stylus Color Photo

• not for Printing	\$499.95
PR12441	

Monitor not included

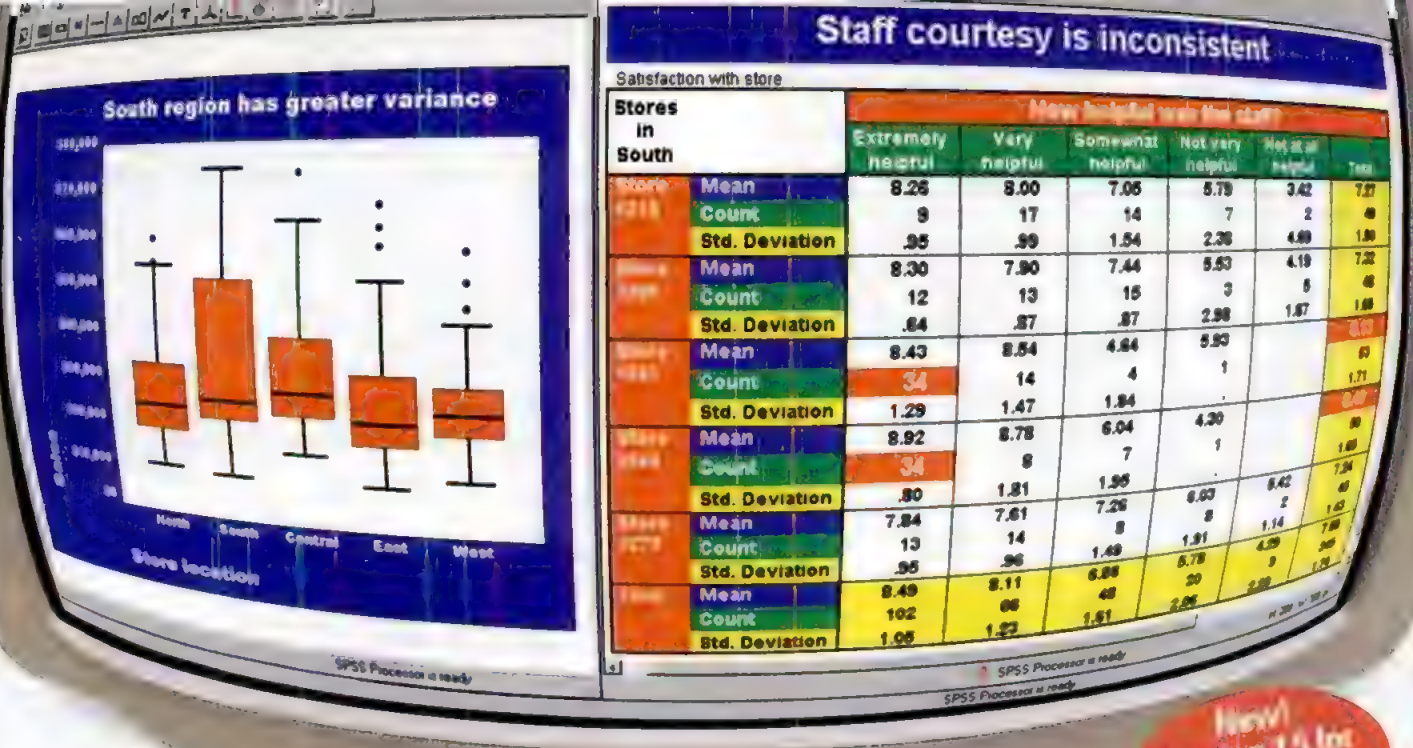
Code # PM1087 Please reference this code when ordering



471 Brighton Drive • Bloomington, IL 61708
Phone: 630-893-0455 • Fax: 630-451-204
6AM-11PM (CT) Mon-Fri • 9AM-4PM (CT) Sat & Sun

1-800-333-4515

www.USAFLEX.com



New!
Version 15 for
Windows 95
and NT

Unleash the power in your data

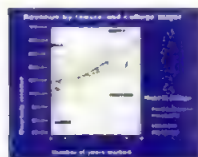
SPSS mines your data in ways no spreadsheet or reporting tool can



Go beyond spreadsheets with analytical techniques such as crosstabs, regression, factor and over 100 others.



Use SPSS' multidimensional pivot tables to discover critical information that might be buried in traditional reports.



Get the best picture of your data with over 60 high-resolution business, professional and quality charts.

The critical information you need, like the variance and distribution of your data, isn't in simple summary reports. To compete and win, you need to take the next step – advanced analysis that leads to better decisions. Use powerful statistical methods and revealing charts to spot patterns and trends. Discover what's significant. Make better forecasts. You don't have to be a statistician to use SPSS. SPSS assists you with a tutorial, step-by-step instructions and "What's this?" help. We help you find a solution with a range of training and analytical consulting services. See our Web site for a white paper on how statistics help you achieve a competitive advantage.

SPSS is used today to:

- Analyze your database
- Accurately forecast sales
- Increase customer satisfaction
- Find the most profitable segments
- Improve mailing responses

"Users will want this program for when their spreadsheets run out of steam." – PC Magazine

"...fast, powerful, robust, and a joy to use." – Windows Sources

"...easy enough for statistics newcomers, but includes features that power users require." – PC World

"...an essential tool" – PC Week



SPSS
Real Stats. Real Easy.™

For more information

Call 1 (800) 543-5833

A5833

or fax 1 (800) 841-0064

Visit our site on the World Wide Web: <http://www.spss.com>
or e-mail: sales@spss.com

We speak your language with 26 offices and 60 distributors worldwide.

[illegible]



digital Business Desktops
Venturis FX2 5166

- 166MHz
- 16MB RAM
- 1.2GB HD

Only \$998

monitor sold separately 44206

COMPAQ

Deskpro 2000 5166X/2100

Now with MMX!

PLUS:

- 2.1GB Smart EIDE HD
- 16MB SDRAM (384MB Max)
- 256K Cache (512K Max)
- S3 Trio 64V2/GS Video w/1MB SGRAM (2MB Max)
- 3-year warranty

NEW!

Only \$1199

monitor sold separately 42757

Call Us First!
THE BEST PRICES ON PC SYSTEMS!
800-800-CPU's



HITACHI
MOBILIZED COMPUTING
Full Multimedia Machine!
VisionBook 4140

42339 **Only \$1799**

- 133MHz MMX
- 16MB RAM
- 1.4GB HD
- 12.1" HA-STN Screen
- 10X CD-ROM
- 33.6Kbps Modem

SAVE
ask about...
LEASING OPTIONS
for BUSINESS
CALL FOR DETAILS

NEW!
Extended service plan
Esp

Supplement the mfr.'s warranty for 4 full years from date of purchase!



TOSHIBA

Tecra 500CDT Notebook!

Light in Weight, Long on Performance!
Flexible! Expandable!

- 120 MHz Pentium
- 16MB RAM (expandable to 144MB)
- 12.1" Active Display
- 1.26GB Hard Drive
- 6X CD-ROM
- Integrated 28.8 Kbps voice/fax/modem
- 3-Year Warranty

Only 2099

16MB RAM FREE!

w/purchase of 500CDT Ask for item #41787 while supplies last

Software!

Business	
43103	ClarisWorks Office for PC..... 57 ⁹⁵
27667	FileMaker Pro 3.0 Tradeup/Upgrade..... 99
44059	ClarisWorks 4.0 Internet Ed. w/FREE Myst..... 94.95
42228	BusinessBasics..... 34.95
37596	PTS Photoshop 4.0 Training (Begin, Int, Adv)..... 79.95*
40794	Corel WordPerfect Suite 8 Win95..... 294.95
* After rebate	
Utilities	
32853	Norton Utilities Win 95..... 74.95
31822	Norton AntiVirus Win 95..... 69.95
35300	Partition Magic 3.0 CD..... 49.95*
40879	CyberAngel..... 79.95
34905	Cybermedia's First Aid 97..... 34.95
26134	Dr Solomon Anti-Virus Tool Kit..... 64.95
* After \$15 rebate	
Games	
40862	Dark Reign..... 49.95
40505	Aaron vs. Ruth..... 39.95
32103	STARFLEET ACADEMY..... 49.95
33248	X-Wing vs. TIE Fighter..... 49.95
Graphics & Design	
43130	NetObjects Fusion 2.0 - NEW LOW PRICE..... 294.95
39399	PhotoTools 1.1..... 94.95
41510	Flightcheck for Win..... 379.95
43162	Adobe Illustrator 7.0 w/FREE PTS Tutorial & CD..... 369.95

Peripherals!

CD-ROM	
38323	Hi-Val 12X Internal IDE..... 599.95
43092	Smart & Friendly 2006 Plus Internal CD-R..... 395
41380	Pinnacle Micro RCDW226 Internal Rewritable CD-R Drive..... 699
Printers/Scanners	
43463	HP Deskjet 1000Cse Printer..... 499
40623	HP LaserJet 6Pse Printer..... 799
40619	HP LaserJet 5se Printer..... 1049
41479	UMAX PageOffice II C Sheetfed Scanner..... 179.95
41775	Microtek ScanMaker V 300 Flatbed Scanner..... 149
39620	Linotype-Hell Jade Flatbed Scanner..... 499
Storage	
19172	Zip 100 Parallel Port..... 149.95
19171	Zip 100 SCSI..... 149.95
19872	Zip 100 10-pack media..... 129.95
23616	Jaz 1GB SCSI External..... 399.95
32556	Jaz 1GB Disks - 3 pack..... 299.95
Video	
37869	IX Micro Turbo TV..... 99
40169	Diamond Monster 3D..... 199.95
39615	Matrox Rainbow Runner..... 249.95
37778	Magnavox MB7000 17" Monitor..... 599
43817	NEC MultiSync E700 Monitor..... 699
43960	ViewSonic OptiQuest V95 19" Monitor..... 1049
36253	Agfa ephoto Digital Camera..... 299.95
41600	Nikon Coolpix 100 Digital Camera..... 699
37680	Sony DSC-F1 Digital Camera..... 699

SUPER LOW SIMMS!

1MB SIMMS as low as \$9.95 13020

4MB as low as \$24.95	8MB as low as \$49.95	16MB as low as \$99.95	32MB as low as \$189.95
---	---	--	---

Nuts & Bolts

The Only Fully Integrated Utilities Suite for Win 3.1 and Win 95!

Only \$39.95*

*\$10 Rebate 39592

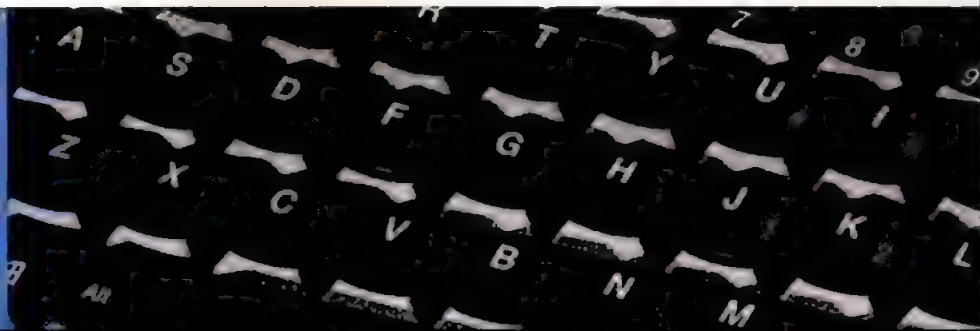
FREE!

Catalog Subscription!

CALL TODAY!

MacConnection & PC Connection
Please allow 4-6 weeks for delivery.
(Mention source code 107PCM2)

Name _____ Apt. _____
Address _____ State _____ Zip _____



HOW FAST DO THESE NOTEBOOKS AND DESKTOPS GO? IT DEPENDS ON HOW FAST YOU DIAL.



To request a fax of weekly specials, call 800 550-1329
and enter document number 10009.

Forget everything you know about factory outlets. Well, almost everything. That's because at Dell Factory Outlet, you won't find damaged computers at skimpy markdowns.

And you won't find out-of-date technology. What you will find at Dell Factory Outlet are the award-winning lines of Dell® computer systems, completely refurbished and tested to meet our high standard of quality. Like notebooks featuring cutting-edge multimedia capabilities. And desktop systems featuring 266MHz Pentium® II processors. But here's the really big news. You can get all of this at incredible savings across the board.

Values so big, we call them **GIGABUYS!** Inventories are limited to quantities in stock, and change regularly. So call us today. Don't miss out on your **GIGABUYS!**

**REFURBISHED DELL
OPTIPLEX DESKTOPS**
166MHz PENTIUM® PROCESSOR

STARTING AT

\$1649

Monitor Sold Separately

**REFURBISHED DELL
DIMENSION DESKTOPS**
266MHz PENTIUM® II PROCESSOR

STARTING AT

\$1939

Monitor Sold Separately

**REFURBISHED DELL
LATITUDE NOTEBOOKS**
166MHz PENTIUM® PROCESSOR
WITH MMX™ TECHNOLOGY

STARTING AT

\$3169

Active Matrix Display

get a
GIGABUY!

TO ORDER, CALL TOLL FREE

1-888-274-4586

MON-FRI 9AM-6PM CST, SAT 9AM-5PM CST

**CALL FOR CURRENT AVAILABILITY AND PRICING.
QUANTITIES LIMITED TO INVENTORY IN STOCK.**

DELL®
FACTORY OUTLET



The Dell Factory Outlet sells only refurbished computers. For pricing on new Dell computers, call (800) 284-0008.

Available configurations may vary. For a copy of our limited warranties, please write to Dell Factory Outlet, 8801 Research Blvd., Austin, TX 78758, Attn: Warranties. See back of your invoice for additional warranty and return policy information. All sales FOB Austin. Sales receipts required for all returns/exchanges. Supplies limited to stock on hand. No rain checks. Prices and specifications subject to change without notice and valid in the U.S.A. only. All items are subject to Dell Factory Outlet's 14-Day Price Protection Policy. Dell, the Dell logo, Latitude, OptiPlex and Dell Dimension are registered trademarks, and "get a GIGABUY!" and GIGABUYS! are service marks of Dell Computer Corporation. Intel, the Intel Inside Logo and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. Dell disclaims proprietary interest in the marks and names of others. Other trademarks and trade names may be used in this document to refer to either the entities claiming the marks and names or their products. Quantities limited. ©1997 Dell Computer Corporation. All rights reserved. Printed in the U.S.A. Reproduction in any manner whatsoever without the written permission of Dell Computer Corporation is strictly forbidden. Dell cannot be responsible for errors in typography or photography.

5005



Your Source for Notebook Values!

TOSHIBA Satellite Pro 440CDX

- 133MHz Intel® Pentium® processor with MMX™ technology
- 16MB RAM, expandable to 144MB
- 1.34GB HDD
- 10X CD-ROM drive
- 12.1" High Contrast Addressing Display
- Advanced 64-bit graphics acceleration
- Supports software playback of full-motion MPEG video with ZV technology

ONLY
\$2399

Item #44991



HOT!

Satellite Pro 460CDT

- 166MHz Intel® Pentium® processor with MMX™ technology
- 32MB RAM & 12.1" SVGA TFT
- 2.0GB hard drive & 10X CD-ROM
- Integrated 33.6 data/fax/voice Modem

ONLY

\$3749

Item #44992



IBM ThinkPad 380D

- 150MHz Intel® Pentium® processor with MMX™ technology
- 16MB RAM & 12.1" SVGA TFT
- 2.1GB hard drive & 8X CD-ROM
- Integrated 33.6 data/fax/voice Modem

ONLY

\$2999

Item #44905



FREE CATALOG!

Call Today 1-800-258-8088

COMPAQ Armada 1530DM

- 133MHz Intel® Pentium® processor with MMX™ technology
- 16MB RAM & 12.1" SVGA DS
- 1.4GB HDD & 10X CD-ROM drive
- 33.6 Kbps Modem

ONLY

\$2499

Item #49330



IBM ThinkPad 560

- 133MHz Intel® Pentium® Processor
- 8MB RAM
- 11.3" SVGA DS
- 2.1GB HDD

ONLY

\$1699

Item #42370



LOWEST PRICE EVER!

FUJITSU LifeBook 435DX

- 133MHz Intel® Pentium® processor with MMX™ technology
- 16MB RAM
- 12.1" SVGA DS
- 1.3GB HDD
- 10X CD-ROM drive

ONLY

\$1799

Item #50263



IBM ThinkPad 770

- 233MHz Intel® Pentium® processor with MMX™ technology
- 32MB RAM & 14.1" SVGA TFT
- 5.1GB HDD & 33.6 d/v/f Modem
- Optional 8-20X CD-ROM drive or DVD drive

ONLY

\$6999

Item #45968



DVD CAPABLE!

NEW!



With over 20,000 products, we are the SOURCE for your computer hardware and software needs. Call us today!



SOURCE CODE
PM710

1-800-258-8088
www.pczone.com

Corporate, Education and Government bids welcome!
Fax your purchase orders to 1-425-430-3420



NO SURCHARGE ON CREDIT CARDS

A NASDAQ COMPANY Ticker Symbol: PCZN

Credit cards are not charged until the order is shipped. Most products ship the same day (barring system failure, etc.). Shipping options include Ground, 2nd Day and Overnight delivery. Freight is based on average product weight. Handling extra. Insurance available. Special orders may require special shipping and handling charges. Please call for international shipping rates. Prices and product availability, subject to change without notice. Specials and promotions may be limited to stock on hand. Not responsible for typographical errors.

© 1997 Multiple Zones International, Inc. All rights reserved. Unauthorized duplication is a violation of applicable laws. Dana Commercial Credit Business Lease 36-month full payout lease with \$1 purchase option based on approved credit 1250 minimum lease amount. Other leasing options available. Administered by Dana Commercial Credit Corporation.

Circle 068 on your reader service card or go to WWW.PCMAG.COM/ProductLink

COMPAQ

Notebooks and Desktops!

Powerful Compaq Notebook and Desktop Features at an Ultra-Low Price!



Compaq Presarios

as low as
\$799!

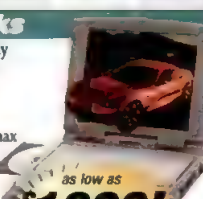
Presario 4000
Monitor sold separately.

Presario 2200
Monitor sold separately.

Order#	Model	Pentium® processor	RAM	HD	CD	Modem	Price
#97918	2200	180MHz Media GX	16MB	1.6GB	8XCD	33.6	'799
#97471	4504	200MHz	16MB	2.1GB	16XCD	33.6	'999
#97469	4506	200MHz w/MMX	24MB	3.2GB	16XCD	33.6	'1,499
#97470	4528	233MHz w/MMX	32MB	3.2GB	24XCD	33.6	'1,799
#97444	4814	233MHz w/MMX	32MB	6.5GB	24XCD	33.6	'1,999
#97468	4824	233MHz w/MMX	32MB	6.5GB	24XCD	33.6	'2,399

Presario Notebooks

- 12.1" high-contrast DSTN/TFT display
 - 150MHz Pentium® processor or 150 and 166 or 200MHz Pentium® processor w/MMX® technology
 - 128-bit accelerated graphics
 - 16MB or 32MB SyncDRAM; 80MB max
 - Premier Sound Audio System
 - 14X or 20X Max4 CD-ROM drive
 - 1.4GB/1.6GB/2.1GB hard drive
- Integrated 14X Max 4 CD-ROM drive, modem and diskette drive means you don't have to swap out devices.



as low as
\$1,999!

Order#	Model	Pentium® processor	RAM/HD/CD	modem	Display	Price
#97787	1210	150MHz	16MB/1.4GB/14X	33.6K	12.1" DSTN	'1,000
#97786	1610	150MHz w/MMX	16MB/1.6GB/14X	56K	12.1" DSTN	'2,000
#99531	1620	166MHz w/MMX	16MB/2.1GB/20X	56K	12.1" STN	'2,000
#90234	1000	166MHz w/MMX	16MB/1.4GB/10X	33.6K	12.1" TFT	'3,400
#99529	1600	200MHz w/MMX	32MB/2.1GB/20X	56K	12.1" TFT	'4,100

DeskPro 2000 Series

- 166MHz, 200MHz or 233MHz Pentium® processor w/MMX® technology
 - 16 or 32MB RAM
 - Up to 3.2GB HD
 - 16X CD-ROM
 - 3D acceleration
 - 2MB VRAM
- Monitor is sold separately.
DeskPro 4000 & 6000 also available please call.



as low as
\$1,239!

Order#	Model	Pentium® processor	RAM	HD	CD	Housing	Price
#97422	5166x/2100	166MHz	16MB	2.1GB	—	Desktop	'1,239
#97423	5166x/3200	166MHz	16MB	3.2GB	—	Desktop	'1,300
#97424	5166x/3200/CDS	166MHz	16MB	3.2GB	16X	MTwr	'1,300
#97425	5200x/2100	200MHz	16MB	2.1GB	—	Desktop	'1,300
#97426	5200x/3200	200MHz	32MB	3.2GB	—	Desktop	'1,370
#97427	5200x/3200/CDS	200MHz	32MB	3.2GB	16X	MTwr	'1,700
#97428	5233x/3200/LDS	233MHz	32MB	3.2GB	16X	Desktop	'1,900



TOSHIBA Notebooks & Desktops

as low as
\$1,699!

MMX™ technology
Monitor Sold Separately



Order#	Model	Pentium® processor	RAM	HD	CD	Display	Wt (lb.)	Price
#97682	519CDT	133MHz	16MB	2.02GB	10XCD	12.1" TFT	8.4	'2,800
#97054	520CDT	166MHz w/MMX*	32MB	2.0GB	10XCD	12.1" TFT	8.4	'4,150
#97055	740CDT	166MHz w/MMX*	16MB	2.02GB	10XCD	13.3" TFT	8.4	'4,700
#97056	530CDT	166MHz w/MMX*	32MB	2.0GB	10XCD	12.1" TFT	8.4	'4,900

Satellite™ Notebook Series

Order#	Model	Pentium® processor	RAM	HD	CD	Display	Wt (lb.)	Price
#96390	220CDS	133MHz	16MB	1.44GB	10X	12.1" DSTN	7.1	'1,800
#97050	440CDX	133MHz w/MMX*	16MB	1.44GB	10X	12.1" HCAD	8.9	'2,350
#97051	440CDT	133MHz w/MMX*	16MB	1.44GB	10X	12.1" TFT	8.9	'2,700
#97052	460CDT	166MHz w/MMX*	32MB	2.0GB	10X	12.1" TFT	8.9	'3,000

*Intel Pentium® processor with MMX® technology versions.

Infinia Desktop Series

Order#	Model	Pentium® Processor	RAM	HD	CD	Modem	Cache	Price
#99437	7202	200MHz w/MMX*	32MB	4GB	16X	56K	256KPB	'1,000
#99435	7230	233MHz w/MMX*	64MB	6.4GB	24X	56K	256KPB	'2,200
#99431	7231	233MHz	64MB	4GB DVD-ROM	56K	256KPB	'2,600	
#99433	7200	266MHz	64MB	6.4GB	24X	56K	256KPB	'2,800

IBM Notebooks - New Low Prices!



as low as
\$1,749!

ThinkPad 380 Series

- 12.1" DSTN/TFT SVGA display with IBM's exclusive Tech-Wide Angle
- Full-size 85-key keyboard with palm rest and Track Point with QuickStop finger control

Order#	Model	Pentium® processor	RAM/HD/CD	Display	Wt (lb.)	Price
#94279*	380	150MHz	16/1.08GB	12.1" DSTN	6.6	'1,740
#94278	3800	150MHz MMX*	16/2.1GB/8X	12.1" TFT	6.9	'3,000

*Includes FREE Sony, Discman®

New! 380E Notebook Series

Order#	Model	Pentium® Processor	RAM	HD	CD	Display	Wt (lb.)	Price
#99517	380E	150MHz w/MMX*	16MB	2.1GB	—	12.1" FRSTN	6.7	'2,100
#99513	380ED	166MHz w/MMX*	16MB	2.1GB	20XCD	12.1" FRSTN	7.0	'2,500
#99515	380ED	166MHz w/MMX*	16MB	3.0GB	20XCD	12.1" TFT	7.11	'3,000

IBM Aptiva S90

- 200MHz Pentium® processor w/MMX® technology
- 32MB RAM/3.2GB Hard Drive 8X CD-ROM/33.6Kbps Modem

Monitor sold separately.

Order#	Model	Pentium® Processor	RAM	HD	CD	Price
#14453	Aptiva S9C	200MHz w/MMX	32MB	4.2GB	16XCD	factory refurbished '1,349

FREE!
Laptop 24 Hour

LifeBook 435DX

- 16-bit Stereo sound w/2 speakers & microphone
- MPEG-1 full-motion video playback & Zoom Video
- 2 Type III/Type III PCMCIA slots
- Lithium-ion battery



as low as
\$1,799!

Open
24
Hours

SONY Ultra-Slim Multimedia Notebooks!

- 150MHz or 166MHz Pentium® processor w/MMX® technology
- 12.1" Active Matrix LCD Display
- 16 or 32MB SD-RAM, 128MB max
- Ultra-slim profile (1.5"), weighing only 5.5 lbs
- Removable 2.1 GB HD
- Integral 33.6Kbps modem 14.4Kbps fax with Built-in speaker phone
- "Sony Tuned" MPEG Digital Video Playback
- Removable 14.5X CD-ROM drive
- Remote Control Headphones
- Infrared adapter for wireless connectivity

as low as
\$3,499!

Order#	Model	processor	RAM/HD/CD	Display	Modem	Price
#99720	PC-705	150MHz MMX*	16/2.1GB/14.5X	12.1" TFT	33.6K	'3,400
#99508	PC-706	166MHz MMX*	32/2.1GB/14.5X	12.1" TFT	33.6K	'4,400

Order#	Model	Accessories	Price
#99722	Personal Docking Station		'200
#99721	AC Adapter		'100
#99723	16MB Expansion Memory		'100

HEWLETT PACKARD

New! HP Brio PCs!

- 166, 200 or 233MHz Pentium® processors with MMX® technology
- 16MB or 32MB EDO RAM
- 2.1, 3.2, 4 or 6GB hard drive
- Some models with 24X CD-ROM
- Some models with 56K modem
- 1 model with HP T3000 tape backup drive
- Some models with MS Word 97
- HP Network and printer drivers pre-installed



as low as
\$999!

3
YEAR
WARRANTY

Order#	Model	Pentium® processor	RAM	HD	CD	Modem	Price
#99511	8012	166MHz MMX	16MB	2.1GB	—	—	'999
#99512	8014	200MHz MMX	16MB	2.1GB	—	—	'1,129
#99485	8174	200MHz MMX	32MB	2.1GB	24X	56Kbps	'1,599
#99486	8175	200MHz MMX	32MB	2.1GB	24X	56Kbps	'1,719
#99513	8017	233MHz MMX	32MB	3.2GB	—	—	'1,419
#99483	8037	233MHz MMX	32MB	3.2GB	24X	—	'1,629
#99487	8177	233MHz MMX	32MB	4.0GB	24X	56Kbps	'1,829
#99488	8178	233MHz MMX	32MB	6.0GB	24X	56Kbps	'2,069

*Model 8012-MS Word 97 software **Model 8012-MS Word 97 software ***Model 8012-MS Word 97 software

\$1.8 Billion Inventory Available!
Over 45,000 Products!
Custom Configuration!
Fastest Overnight Delivery!



Computer Price!

Call us before you order from anyone else. We want your business!

NEW! HP Color InkJet Printers

\$449.99
#14435

HP DeskJet 890Cse Printer
HP's Fastest InkJet Printer!

The 890Cse features the smallest ink drops for more shades of color.

- Up to 9ppm black
- Up to 5ppm color
- Paper sizes: 4" x 6" to legal
- Network capable with JetDirect print server

Photo-Quality on Any Paper!

Order#	Product	Price
#96532	HP DeskJet 400L printer	\$149
#94713	HP DeskJet 672C printer	\$199
#74606	HP DeskJet 340 portable printer	\$299
#91234	HP DeskJet 694C printer	\$299
#79790	HP DeskJet 820Cse printer	\$249
#82695	HP DeskJet 870Cse printer	\$399
#96784	HP DeskJet 1600C printer (factory refurbished)	\$799

LEXMARK Data S1250 Laser Printer

New Low Price!
Optra S1250
\$1,028.99
#96779

- 1200 x 1200dpi
- 12ppm
- Postscript-3 PCL6
- 250 sheet paper tray
- 4MB RAM (64MB max)

#96780 Optra S1250n - Includes Ethernet Card \$1318

Drive Deals!

Discman Special Offer!

2X, 300KB/sec transfer rate, 380ms access

PCMCIA type II card

Includes stereo adapter, headphones and AC adapter

Plays audio CDs too!

FRD-150 Discman
only **\$79.99**
#90667

Factory Refurbished

SuperDisk LS-120 Floppy Drive

- Store 120MB on a floppy drive
- Downward compatible with both 1.44MB and 720KB floppies
- Provides 83 times the storage capacity of standard 1.44MB diskettes

\$99.99
#98022

Jaz Insider 1GB Drive
w/FREE Gravity

- 12ms aver. seek time
- 6.7MB/sec. transfer rate
- Up to 2GB compressed

\$299.99
#98021

Jaz Insider 1GB Drive
w/FREE Gravity Newsreader

\$399.99
#98022

Western Digital Blowout!

1.2GB EIDE Hard Drive
111MS Access Time | Easy Installation

Order#	Manufacturer	Product	Price
#98810	Maxtor	Crystal Max/2 1GB EIDE	\$189
#95264	Maxtor	Crystal Max/3 0GB EIDE	\$224
#90693		Medalist 1720 1 GB EIDE	\$182
#92137		Medalist 2132/2 1GB EIDE	\$157
#92185	Seagate	Barracuda 2 1GB Ultra SCSI	\$174
#90251		Barracuda 4 3GB Ultra SCSI	\$699
#82744	Quantum	Fireball 3 2GB EIDE	\$288
#92187		M 16XX Series 1 GB/EIDE	\$185
#92188		M 16XX Series 2 1GB/EIDE	\$189
#90695	Fujitsu	Caviar AC22100/2 1GB/EIDE	\$194
#90696		Caviar AC22100 4 0GB/EIDE	\$294
#92383	Western Digital	Enterprise 2 1GB SCSI 3	\$451
#97950		Enterprise 4 3GB-Ultra SCSI	\$659

PNY Simple Kingston

Give Your CPU a Performance Boost!
Your #1 Source for Memory

4MB AS LOW AS \$24 #4408

8MB AS LOW AS \$39 #4177

16MB AS LOW AS \$59 #05416

Free Software when you buy memory from PC Mall. Your choice: First Aid, Oil Change, or Uninstaller

Upgrade your 486 to 133MHz!

Gainberry 586-133MHz CPU
Upgrade for 486 CPUs

only **\$69**
#81789

- Direct replacement of the old 486 chip
- Upgrades most 486DX, SX, DX2 and SX2 systems

Smart One 56K Modem
Internal Modem

only **\$99.99**
#93029

Blowout!

28.8 Montana PC Card Modem

- Plug-n-Play quick installation
- Fully ITU Group 3 compatible
- w/Class 1 fax software package
- Refurbished 1-yr warranty

\$69.99
#73589

Fastest Modem Ever...56Kbps!

1 YEAR WARRANTY

\$147.99*

Order#	Product	Price
#97968	Sportster 56K External Fax Modem	\$167
#97967	Sportster 56K Internal Fax Modem	\$147
#98437	Sportster 33.6 External Fax Modem	\$118
#98436	Sportster 33.6 Internal Fax Modem	\$88

*After \$50 mail-in rebate. Rebate expires 1/17/98.
*After \$20 mail-in rebate. Rebate expires 10/04/97.

FREE WebPainter(a \$99 Value)
w/any modem purchase!

OfficeConnect Hubs

3Com

as low as **\$68.99**

- Installs in under 10 minutes
- 4, 8 or 16 RJ-45 10Base-T connections
- Ergonomic design saves space and ensures silent operation

Order#	Product	Price
#80096	TP4 4-Port 10Base-T Hub, (4) RJ-45	\$69
#80097	TP4/Combo 4-Port 10Base-T Hub, (4) RJ-45, (1) BNC, (1) AUI	\$88
#81612	8TPQ 8-Port 10Base-T, (8) RJ-45	\$118
#81613	8TPC 8-Port 10Base-T, (8) RJ-45 with BNC Uplink	\$148
#81614	8TPM 8-Port 10Base-T, (8) RJ-45, Manageable, with BNC Uplink	\$374
#80098	TP16C 16-Port 10Base-T Hub, (16) RJ-45, (1) BNC	\$244
#87046	8TP100 8-Port 100Base-TX, (8) 100/RJ-45	\$508

PRINCETON New! MONITOR BLOWOUT!

Ultra 72 17" Color Monitor
128dpi, 1024 x 768 resolution

only **\$399.99**
#99724

1 FREE 100MB Zip Disk

zip

lomega® 100MB Zip™ Drive Blowout!

\$89.99

Price reflects \$10 mail-in rebate from PC Mall through 10/31/97

#13785 Parallel, External Factory Refurbished 1-Year Warranty

#98023 Zip 100MB SCSI Drive (factory refurbished) **\$99.99**

#13786 Zip 100MB Parallel Drive **\$109.99**

Price reflects \$20 mail-in rebate from PC Mall through 10/31/97

Ask About Our Great Zip Media Offers!

QuickCam Blowout!

Connectix Color QuickCam only **\$99.99**
#13840

Factory Refurbished

FREE! Carrying Case
w/Any Notebook Purchase!

A \$9 Shipping and Handling fee applies.
Bag shipped may vary slightly from that shown

FREE! ISA Combo Ethernet Adapter
w/Any Desktop Purchase!

Pay only \$9* for Shipping and Handling.
Ask for #98024

No Credit Card Surcharges

VISA **MasterCard** **American Express** **Discover**

We accept Visa, MasterCard, American Express and Discover!

Prices and specifications subject to change without notice. Limited to stock on hand. IMPORTANT: While we do our best to check errors, mistakes may occur—call to verify pricing.

Open Account. PC Mall offers Net 15 day terms to government agencies, schools and businesses with instant approval to qualified customers. Your Personal Account Executive can assist you in your application. Please allow up to 3 days for credit approval.

Leases. Lease anything from one PC to one hundred for truly affordable rates!

Volume Licensing. Supply your entire office with the latest software versions for less!

Call for Details!

Order
And Register to

Win a NEW Mercedes SLK!

No purchase necessary. Call for details.

Call Today to get Your FREE PC Mail and DataCom Mail Catalogs!

Order Any Time! Open 24 Hours.

1-888-901-MALL

Order Today by 11 pm EST—Get It Tomorrow by 10:30 am

www.pcmall.com Use Source Code #ZPCM7A2

WORLD WIDE WEB HOT DEALS!

- Over 36,000 Products On-Line
- Detailed Product Information
- Latest Low Pricing - Updated Frequently
- Safe Secure On-Line Ordering
- Free Computer Product Giveaways
- Open 24 Hours a Day, 7 Days a Week

www.firstsource.com

Canon

**BJC-4300 COLOR
BUBBLEJET PRINTER**

- Photo-Realistic Color
- 5 PPM
- Scanner Cartridge Option

LOWEST PRICE \$199

**SYJET 1.5GB
REMOVABLE DRIVE**

3GB DEAL! Get an extra 1.5GB cartridge with purchase of SyJet 1.5GB drive (while supplies last)

\$299

STANDARD PRICE \$399



Sony Computer Entertainment Inc.

NETWORK STARTER KIT

- 2 PCI 10BaseT Adapters
- 1 Five Port WorkGroup Hub
- 2 Fifteen Ft. UTP CAT-5 Cables
- Network Software Drivers

\$109

LIFEBOOK 435DX NOTEBOOK

- Intel Pentium 133MMX Processor
- 16MB Memory
- 1.3GB Hard Drive
- 10X CD-ROM

\$1,750

MICROSCAN 5P

- 17" (16" Viewable Area)
- 28mm
- Flat Square Tube

ADJ. **\$479**

• Max Res. 1280x1024 @65Hz

PARAGON MEMORY
INFINITY NOTEBOOK HD

Replace Your Hard Drive

STARTING @ **\$299**

800-261-9866
www.firstsource.com

MAIL OR FAX ORDERS TO:
 (714) 448-7750 • FAX (714) 448-7760
EMAIL ADDRESS: sales@firstsource.com
 7 Journey • Aliso Viejo, California 92656
FSI SALES HOURS:
 Monday - Friday 6am - 5pm • Saturday, 7am - 4pm

TECH SUPPORT HOURS:
Monday - Friday + 7am - 5pm (All hours Pacific Standard Time)
Technical Support (714) 448-7770

uctLink

16MB	PC133MMAB	\$110	Thunder 755 755 480 Models	
16MB	PC133MMAB		6MB	07C121
16MB	PC133MMAB	\$60	Thunder 345 345 000/CLUSE/PR 370	\$139
16MB	PC133MMAC	\$109	755 Pentium Models	
HP 486 Models			6MB	04C097
16MB	PC133MMAB	\$60	16MB	04C095
16MB	PC133MMAC	\$99	22MB	n/a

CIRCLE 272 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

WE WILL TRY TO MATCH OR BEAT ANY ADVERTISED PRICE. CALL FOR LATEST PRICING!!

WE ACCEPT PO'S
FROM QUALIFIED FIRMS

30 DAY
MONEY BACK
GUARANTEE

MEMORY

LIFETIME
WARRANTY

SECURITY WILL CALL WINDOW NOW
OPEN! NO SURCHARGE FOR MC,
VISA & DISCOVER

HOT BOX SPECIALS

HP 4, 4P, 5P, 6P, 5MP - 2Meg	14.00
Panasonic Laser 6500 - 2Meg	14.00
HP Deskjet 1200C, LP - 2Meg	14.00
Lexmark Optra - 2Meg	14.00
1 x 9-80	9.00
1 x 9-70	12.00
1 x 3-70	6.00
1 x 9-60	12.00
Compaq Concerto - 8Meg	39.00
71500, 5100, 5200 Base - 8Meg	29.00

Check our website for additional items not listed in
this ad. Ordering through our secure website at
www.4LATrade.com

DIMMS (168 pin)			72 PIN SIMMS (FPM, EDO)		
SORAM - INDUSTRY STANDARD, DELL & GATEWAY					
3.3V (2 clock)	8Meg	50.00	1 x 32 4 mg	22	22
3.3V	16Meg	14.00	2 x 32 8 mg	42	42
3.3V	32Meg	179.00	4 x 32 16 mg	88	88
3.3V	64Meg	429.00	8 x 32 32 mg	188	188
3.3V	128Meg	950.00	16 x 32 64 mg	418	418
3.3V	256Meg	1925.00	1 x 32 8 mg EDO	22	22
			2 x 32 8 mg EDO	42	42
			4 x 32 16 mg EDO	88	88
			8 x 32 32 mg EDO	188	188
			16 x 32 64 mg EDO	418	418
			256 x 32 mg	10	-
			512 x 32 mg	10	-

Ask Our Advisors

HARDWARE

The Shrinking Hard Disk

I have a Pentium/133 with Windows 95 and a 1.2GB hard disk. Everything was fine until I got on the Internet. Before doing so I had about 500MB free disk space and no problems. We started downloading shareware and working on designing our own Web pages. Within a couple of weeks, we were down to less than 200MB and fighting to keep it above 100MB after a while longer. I first thought that this was just due to our getting carried away with the downloads and creating new files. I started looking at the disk space again, and DIR /S only showed about 800MB used by files. An additional 20MB was taken up by hidden and system files. I started wondering if a virus was causing the problem, but two separate utilities showed that the system was clean. Do you have any idea what could be causing the problem?

CONNIE POWERS
via the Internet

PC MAGAZINE: It's quite possible that nothing's wrong with your system, and your hard disk is simply being consumed by small files created by your Internet use. Most Web browsers keep all sorts of temporary files that can rapidly take up large amounts of your hard disk space.

There are two major types of temporary files that browsers keep. History files contain the URLs (the addresses) of the sites you have visited in a recent period. It's easy to have hundreds of items in this list, even if you have your browser save the history for only a few days.

The other type of temporary file is a cached page. This is a Web page element that is stored on your disk so that the page will load faster when you return to that site. These can vary in size from a few dozen bytes for a small icon to thousands of bytes for a large graphic. These files can accumulate rapidly after just a few surfing sessions.

The problem is revealed when you look at how your computer stores files on the hard disk. Each file has to have an entry in the FAT (file allocation table), and there are a fixed number of FAT entries available for each hard disk partition. As a result, each entry refers to a number of sectors, called a cluster or allocation unit. As the size of the hard disk partition gets larger, the cluster size also increases. For a 500MB partition, the cluster size is 8K. If you

have 500 history entries and 1,000 cached page files, these may show up as taking up about 6MB using the DOS DIR command, but in fact they will take up at least one cluster per file, or 8K times 1,500 files, for a total of at least 12MB.

In this case, however, the partition size is 1.2GB, so the cluster size will be 32K apiece. The 1,500 temporary files will consume at least four times as much, or 48MB.

One way around the problem is to repartition your hard disk so that the cluster size is smaller. This can be a difficult procedure and you'll want to make sure that you have a complete backup of all your data before you start. A utility such as Partition Magic can make the job easier.

You may not have to take such drastic action to solve the problem, however. You may simply be able to change some of the configuration settings for your browser. For example, Microsoft Internet Explorer lets you set how many days of history files to retain, and what percentage of your hard disk to allocate to your cached page files. By reducing these settings, you can greatly reduce the amount of storage space that your browser takes up on your hard disk. Specifically, run the Internet applet from Control Panel or choose Options from IE3's View menu. On the Navigation page, you can set the time limit for history files, or clear the history list. Press Settings on the Advanced page to set the amount of disk space devoted to temporary files, or empty the temporary files folder.

—Alfred Poor

OPERATING ENVIRONMENTS

Fixing Control Panel Start-Up Problems

Windows 95 presents me with a strange message on start-up: "Unable to register the Control Panel." I've checked every setting and all properties in Control Panel and found nothing unusual. I've drilled into the Registry to the several Control Panel areas; again, nothing. If I click OK, the message disappears and Windows 95 runs fine. All of my applications are available, and there's no apparent slowdown on my homebuilt 100-MHz Pentium system.

I've been able to find no information or help on this. Can you offer some insight or solution?

ROBERT ARISOHN
via the Internet

PC MAGAZINE: The probable cause is a corrupted .CPL file, or a file with the .CPL extension that is not actually a Control Panel applet. Use the command Find Files or Folders from the Start menu to find all the files with the extension .CPL that are in or below the Windows 95 directory. Right-click on each file and select "Open with Control Panel." If the item opens successfully, close it and go on to the next. Chances are good you'll find one that fails to load—that's your culprit! Change the file's extension or move it to another directory and your problem should go away.

—Neil J. Rubenking

Display Difficulties

As Figure 1 shows, my Norton File Manager suddenly began displaying filenames in some kind of secret code. Why did this happen, and how can I restore my display to normal?

V. NARAYANASWAMY
via the Internet

PC MAGAZINE: Your system somehow decided to use Monotype Sorts as its system font. Monotype Sorts is a TrueType symbol font

OUR ADVISORS

Alfred Poor is a contributing editor and the author of *The Underground Guide to Hardware*.

Brian Proffitt is a contributing editor of *Computing Today* and the author of *OS/2 Warp Survival Kit*.

Sal Ricciardi is a contributing editor and the author of the *Running Fox-Pro* series from Microsoft Press.

Neil J. Rubenking is technical editor and author of *Delphi Programming for Dummies*.

Luisa Simone is a contributing editor and the author of *Microsoft Publisher by Design*.

Craig Stinson is a contributing editor and the coauthor of *Running Windows 3.1* and *Running Microsoft Excel*.

M. David Stone is a contributing editor and the coauthor of *Word for Windows Companion, Second Edition*.

PCTech Ask Our Advisors

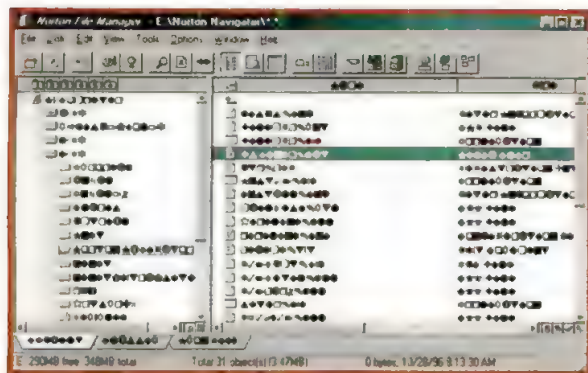


FIGURE 1: A font glitch by Windows turns normal program displays into gibberish.

used by Windows as a substitute for Zapf Dingbats. To demonstrate for yourself that this is what happened, start Microsoft Word or any word processor that permits access to a full range of fonts. Enter the string "Name." Then highlight it and change the font to Monotype Sorts. You'll find that it changes into the same four symbols found at the top of the Name column in your Norton File Manager.

There have been other reports of problems involving this little-used font. The simplest solution is remove it from the system using the Fonts applet in Control Panel. With Monotype Sorts out of the picture, your system will again display a normal, human-readable font as its system font. —Neil J. Rubenking

Finding an OS/2 CD-ROM Driver

I installed a new CD-ROM drive in my OS/2 Warp system, and I'm faced with an unusual problem. The new drive is from a different manufacturer, so my old device driver doesn't work. And since I can't get OS/2 to recognize my CD-ROM drive, I can't get the appropriate device driver off the Warp CD-ROM. Can you help?

BEN GOULD
Stamford, Connecticut

PC MAGAZINE: For future reference, note that it's probably a good idea to copy the new device driver from Warp's Device Driver Pak CD-ROM before installing the new drive. Of course, that may not be an option if, for example, the old drive has died. If you don't have access to another CD-ROM drive, the next place to look is online. Check <http://service.software.ibm.com/os2ddpak/> for OS/2 device drivers. If you can't find the right one there, try www.uk.ibm.com/getdoc/psmemea/progserv/device/ next. This site adds links to the FTP and BBS sites of many hardware manufacturers.

If you're still unsuccessful or you don't have access to the Internet, all hope is not lost. Try booting the Warp installation disks; at the installation panel you see after inserting the second disk, press F3 to exit to a command prompt. Try to access your CD-ROM drive from that prompt. This won't work if the drive hasn't been assigned a letter; about the only thing you can do in that case is call the manufacturer of the CD-ROM drive and ask it to send you the

driver. If the drive has been assigned a letter, you know that one of the device drivers on those disks will work with your drive. The trick is finding out which one.

Remove the install floppy disk and boot Warp normally. Using your favorite editor, compare the Config.sys file on the first install disk with the Config.sys on your hard disk's boot drive. You'll find a number of basedev= statements on the floppy disk file that aren't on your own Config.sys. Copy these statements to your hard disk's Config.sys file and reboot. Your CD-ROM drive should be recognized during the boot.

You'll probably want to go back now and

With Monotype Sorts out of the picture, your system will display a normal, human-readable font as its system font.

start removing the extra device drivers from your Config.sys one at a time, until you're loading only the modules you need. The required files will vary based on the model of drive you have, but many people will find that they can get by with IBM's generic IDE CD-ROM support. Try putting REM in front of all the new lines you copied from the floppy disk (to turn them into remarks rather than commands) except:

```
basedev=ibm1s506.add  
basedev=ibm1dec.d.add
```

Boot the system again. If your CD-ROM drive works, you can remove all the lines you

"REMarked" out. Now that you have your CD-ROM drive working, you can look at the Device Driver Pak CD that came with Warp and see whether it has a specific driver for your CD-ROM. If so, that driver will probably take better advantage of the features of your drive than the generic IBM driver.

If you have access to the Internet, it's a good idea to update the base device drivers on the installation disks and in the \os2\boot directory of your hard disk. Go to [ftp://ftp.software.ibm.com/ps/products/os2/drivers/misc](http://ftp.software.ibm.com/ps/products/os2/drivers/misc) and download Warpinst.exe. This self-extracting file will allow Warp to be installed from many more CD-ROM drives.

—Brian Proffitt

WORD PROCESSING

Toggling a File Open Menu Item

Thanks so much for the macro that resets the File Open command to open all files ("Using File Extensions in Word," April 22, 1997). I've been looking for a way to do precisely that. I'd also be interested in the companion macro for toggling the original macro on and off, which you mentioned.

ROBERT J. CIHAK
Aberdeen, Washington

PC MAGAZINE: We received enough requests for the second macro to make it clear that there are plenty of readers still using Word 6 and 7 who can benefit from both the particular macro and from learning a technique to toggle a menu item between two commands. As a starting point for this discussion, I'll assume you already have a macro named FileOpen installed and that you're running that macro when you give the File | Open command. The step-by-step details here are based on Word 7. They may be slightly different for Word 6. The macro should work in both versions, though I've tested it only with Word 7.

Figure 2 shows the macro for toggling the Open choice on the File menu between running the built-in FileOpen command and running the macro that's meant to replace it. (You can download this macro from PC Magazine Online; look for the file Toggle.doc in the issue archive file.) Note that the macro assumes there is a menu item you've added to the File menu that runs the macro itself. When you run this macro to toggle what the File | Open command runs—the built-in command or the macro to replace it—this macro also renames its own menu item. The two names for the new menu item are "Toggle



System configuration can be a puzzle.

Even our customers find it frustrating to do their best things to do from the system. We have the trained technicians and the quality controlled environment to do the job right — from the initial system setup, memory, install software correctly, add the right hardware — we do it all. So call us. We get the system you want and the way you want it. People who know their stuff.



Western Digital

Ultra DMA/33 with 33.3MB/sec. transfer rates are here!

6.4GB Ultra DMA/33 IDE Hard Drive

- 6449MB capacity
- 9.5ms access time
- 512K cache
- 5400RPM
- 3.5" form - 1" height
- 33.3MB/second max. transfer rate
- Ultra DMA IDE interface

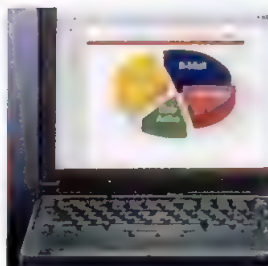
\$399.99

WD36400AB



ThinkPad 380ED Notebook Affordable All-in-One Convenience!

- 166MHz Pentium® processor with MMX™ technology
- 12.1" Fast Response (FRSTN) display
- 16MB EDO DRAM (80MB max.)
- 2 1GB hard drive
- Integrated floppy diskette, hard disk and CD-ROM drives



\$2299.99

IBT26355AU

In Touch with Tomorrow TOSHIBA

Satellite Pro 440CDT Notebook Innovative Technology — Uncompromising Value!

- 133MHz Pentium® processor with MMX™ technology
- 256K Level 2 cache
- 12.1" Active Matrix display 800 x 600 resolution
- 16MB EDO DRAM (144MB max.)
- 1 44GB hard drive
- 33.6Kbps data/fax modem



\$2799.99

TA440CDT



LaserJet 6LXI Printer HP's most affordable laser printer for business!

- 6ppm, fast return to application with 18-sec. first page out
- 600 dpi for crisp, clear output with HP's exclusive Resolution Enhancement technology (RET)
- Includes the HP Internet Custom News Kit
- 1 year manufacturer's warranty with HP Express Exchange



\$389.99

HPLJ6LXI



DeskPro 2000 System Outstanding Features and Affordability

- 166MHz Pentium® processor with MMX™ technology
- 16MB SDRAM (384MB max.)
- 2 1GB SMART hard drive
- S3 Trio V2/GX Enhanced 64-bit graphics
- 1MB SGRAM video
- 5 bays/5 slots
- Windows® 95



*Monitor shown sold separately

\$1199.99

278700-002

from start to finish.



Is there one or only a few peripheral direct marketers to win this coveted PC Magazine Award?

MEMORY UPGRADES

PNY Industry Standard Memory		RAM	16MB	32MB		
72-Pin, 60ns (non-parity)	PTX332-60	\$39.99	PTX332-60	\$59.99	PTX332-60	\$129.99
72-Pin, 60ns (parity)	PTX336-60	\$9.99	PTX336-60	\$9.99	PTX336-60	\$179.99
72-Pin 60ns, EDO	PTX332-60E	\$9.99	PTX332-60E	\$9.99	PTX332-60E	\$129.99

Kingston Notebook Memory	RAM	16MB	32MB
Toshiba Satellite Pro 400, 100CS	KT400B/0 \$99.99	KT400B/16 \$159.99	KT400B/32 \$279.99
Toshiba Terra 700C, CS	KT700B/0 \$109.99	KT700B/16 \$169.99	KT700B/32 \$299.99
Toshiba Portege 610C; Satellite 200, 410, 420, 430;			
Terra 710, 720, 730 & 740	KT610B/0 \$99.99	KT610B/16 \$159.99	KT610B/32 \$279.99
Toshiba 500CS, CT	KT500B/0 \$99.99	KT500B/16 \$149.99	KT500B/32 \$269.99
Toshiba Portege 650C, 660C	KT650B/0 \$99.99	KT650B/16 \$149.99	KT650B/32 \$269.99
AST J10, J30	KJAS10 \$9.99	KJAS116 \$59.99	KJAS132 \$89.99
AST P30, P40, P50	KJAS30 \$9.99	KJAS316 \$59.99	KJAS332 \$89.99
Compaq Armada 1100 Series	KY11459 \$79.99	KY11460 \$139.99	KY11461 \$219.99
Compaq Armada 4100 Series	KY4100B/0 \$79.99	KY4100B/16 \$149.99	KY4100B/32 \$279.99
IBM 760 E Series; 560; 365X, 3D	KY760B/0 \$79.99	KY760B/16 \$149.99	KY760B/32 \$269.99
NEC Versa 6000 Series	KY600B/0 \$99.99	KY600B/16 \$149.99	KY600B/32 \$259.99
TI Travelmate 602, 6030, 6050	KY600B/0 \$99.99	KY600B/16 \$139.99	KY600B/32 \$259.99
TI Extensa 600 and 900 Series	KY600B/0 \$99.99	KY600B/16 \$139.99	KY600B/32 \$259.99

SYSTEMS

Toshiba Models	System	Price
Equium 5160D, 166MHz Pentium® MMX™, 32MB RAM, 2.07GB HDD, 12X T00T18220		\$1,299.99
Equium 5200D, 200MHz Pentium® MMX™, 32MB RAM, 2.38GB HDD, 12X T00T18230		\$1,449.99
Infinito 7202, 200MHz Pentium® MMX™, 32MB RAM, 4.0GB HDD, 16X T00T18210		\$1,399.99
Infinito 7230, 233MHz Pentium® MMX™, 64MB RAM, 4.6GB HDD, 24X T00T18230		\$2,299.99

IBM Models	System	Price
PC 300GL, 200MHz Pentium® MMX™, 32MB RAM, 2.5GB HDD H618149		\$1,249.99
PC 300GL, 166MHz Pentium® MMX™, 16MB RAM, 2.5GB HDD H618151		\$1,159.99
PC 300GL, 200MHz Pentium® MMX™, 32MB RAM, 2.5GB HDD H618151		\$1,399.99

Compaq Models	System	Price
DeskPro 2000, 166MHz Pentium® MMX™, 16MB RAM, 2.1GB HDD 27809-002		\$1,199.99
DeskPro 2000, 200MHz Pentium® MMX™, 16MB RAM, 2.1GB HDD 27809-002		\$1,389.99
DeskPro 2000, 200MHz Pentium® MMX™, 32MB RAM, 3.2GB HDD, 16X 27809-002		\$1,749.99

Sony Personal Computer Models	System	Price
PCV-130, 200MHz Pentium® MMX™, 32MB RAM, 4.3GB HDD, 24X S0PCV130		\$2,099.99
PCV-150, 233MHz Pentium® MMX™, 32MB RAM, 4.3GB HDD, 24X S0PCV150		\$2,299.99

MONITORS

Mag Innovation	Model	Price
DJ530, 15"/13.9" screen/view, 800 x 600 resolution @ 85Hz, 28mm dot pitch	DJ530	\$309.99
DJ700, 17"/16.1" screen/view, 800 x 600 resolution @ 85Hz, 26mm dot pitch	DJ700	\$379.99
DJ702E, 17"/16.1" screen/view, 1024 x 768 resolution @ 75Hz, 28mm dot pitch	DJ702E	\$489.99
DJ707, 17"/16.1" screen/view, 1024 x 768 resolution @ 85Hz, 26mm dot pitch	DJ707	\$609.99
DJ717, 17"/16.1" screen/view, 1280 x 1024 resolution @ 85Hz, 26mm dot pitch	DJ717	\$734.99
DJ920, 21"/19.8" screen/view, 1280 x 1024 resolution @ 85Hz, 28mm dot pitch	DJ920	\$1,504.99

Princeton	Model	Price
ED40, 14"/13.4" screen/view, 800 x 600 resolution @ 75Hz, 28mm dot pitch	ED40	\$204.99
ED50, 15"/13.8" screen/view, 1024 x 768 resolution @ 75Hz, 28mm dot pitch	ED50	\$278.99
ED70, 17"/15.8" screen/view, 1024 x 768 resolution @ 75Hz, 28mm dot pitch	ED70	\$449.99
ED72, 17"/15.8" screen/view, 1024 x 768 resolution @ 75Hz, 26mm dot pitch	ED72	\$444.99
ED74, 17"/16" screen/view, 1024 x 768 resolution @ 75Hz, 25mm dot pitch	ED74	\$429.99
ED75, 17"/15.8" screen/view, 1280 x 1024 resolution @ 85Hz, 26mm dot pitch	ED75	\$594.99
ED76, 17"/16" screen/view, 1280 x 1024 resolution @ 75Hz, 25mm dot pitch	ED76	\$709.99
ED90, 19"/18" screen/view, 1280 x 1024 resolution @ 75Hz, 28mm dot pitch	ED90	\$859.99

PRINTERS

Hewlett-Packard	Model	Price
HP DeskJet 692C, 8ppm, 512K, 600 dpi HPD692C	HP DeskJet 692C	\$299.99
HP DeskJet 870Cxi, 8ppm, 512K, 600 dpi HPD870Cxi	HP DeskJet 870Cxi	\$389.99
HP LaserJet 6Lz, 6ppm, 1MB, 600 dpi HPJ6Lz	HP LaserJet 6Lz	\$389.99
HP LaserJet 6Pxi, 8ppm, 2MB, 600 dpi HPJ6Pxi	HP LaserJet 6Pxi	\$759.99

Epson	Model	Price
Stylus 400, 4ppm, 720 dpi EPS400C	Stylus 400	\$199.99
Stylus 600, 6ppm, 1440 dpi EPS600C	Stylus 600	\$299.99
Stylus 800, 8ppm, 1440 dpi EPS800C	Stylus 800	\$449.99

Canon	Model	Price
BJC-4200, 5ppm, 720 dpi, 62KB CMYK4200	BJC-4200	\$169.99
BJC-4200, 5ppm, 720 dpi, 64KB CMYK4200	BJC-4200	\$249.99

MODEMS

US Robotics	Model	Price
Sportster 56K, Winmodem, Internal, 56K/14.4 MBS1783	Sportster 56K	\$129.99
Sportster 56K, Internal, 56K/14.4 MBS1787	Sportster 56K	\$149.99
Sportster 56K, External, 56K/14.4 MBS1788	Sportster 56K	\$169.99
Sportster Voice 56K, Internal, 56K/14.4 USK19168	Sportster Voice 56K	\$169.99
Sportster Voice 56K, External, 56K/14.4 USK19169	Sportster Voice 56K	\$189.99
Courier XEverything, Internal, 56K/14.4 USK49443	Courier XEverything	\$209.99
Courier XEverything, External, 56K/14.4 USK49439	Courier XEverything	\$229.99

* Price after \$50 manufacturer's mail-in rebate. Rebate ends 1/17/98.

HARD DRIVES

Western Digital Hard Drives	Model	Price
1620MB IDE Caviar, 12ms access, 128K cache, 5,200 RPM, 16.6MB/sec WD1620MB	WD1620MB	\$169.99
2000MB IDE Caviar, 11.5ms access, 128K cache, 5,200 RPM, 16.6MB/sec WD2000MB	WD2000MB	\$199.99
3166MB IDE Caviar, 12ms access, 128K cache, 5,200 RPM, 16.6MB/sec WD3166MB	WD3166MB	\$229.99
3249MB UDMA Caviar, 11ms access, 256K cache, 5,200 RPM, 33.3MB/sec WD3249MB	WD3249MB	\$229.99
4000MB IDE Caviar, 12ms access, 256K cache, 5,200 RPM, 16.6MB/sec WD4000MB	WD4000MB	\$279.99
5160MB UDMA Caviar, 11ms access, 256K cache, 5,400 RPM, 33.3MB/sec WD5160MB	WD5160MB	\$369.99
6449MB UDMA Caviar, 9.5ms access, 512K cache, 5,400 RPM, 33.3MB/sec WD6449MB	WD6449MB	\$399.99

Seagate Hard Drives	Model	Price
1277MB IDE Modelist, 12ms access, 128K cache, 4,500 RPM, 16.6MB/sec ST31277MB	ST31277MB	\$149.99
1700MB IDE Modelist, 12ms access, 128K cache, 4,500 RPM, 16.6MB/sec ST31700MB	ST31700MB	\$159.99
2120MB UATA Modelist, 12ms access, 128K cache, 4,500 RPM, 33.3MB/sec ST32120MB	ST32120MB	\$179.99
2122MB UATA Modelist, 12ms access, 128K cache, 4,500 RPM, 33.3MB/sec ST32122MB	ST32122MB	\$179.99
2530MB IDE Modelist, 12ms access, 128K cache, 4,500 RPM, 16.6MB/sec ST32530MB	ST32530MB	\$179.99
3232MB UATA Modelist, 12ms access, 128K cache, 4,500 RPM, 33.3MB/sec ST33232MB	ST33232MB	\$209.99
4340MB IDE Modelist, 12ms access, 128K cache, 4,500 RPM, 33.3MB/sec ST34340MB	ST34340MB	\$259.99
4342MB UATA Modelist, 12ms access, 128K cache, 4,500 RPM, 33.3MB/sec ST34342MB	ST34342MB	\$259.99
6450MB UATA Modelist, 9.5ms access, 128K cache, 5,400 RPM, 33.3MB/sec ST36450MB	ST36450MB	\$369.99
1050MB SCSI Hawk 2XL, 9ms access, 512K cache, 5,411 RPM, 20MB/sec ST31050MB	ST31050MB	\$319.99
2149MB SCSI Hawk 2XL, 9ms access, 512K cache, 5,400 RPM, 40MB/sec ST32149MB	ST32149MB	\$369.99
4294MB SCSI Barracuda 4, 8ms access, 1,024K cache, 7,200 RPM, 10MB/sec ST34294MB	ST34294MB	\$619.99
4572MB SCSI Barracuda 4XL, 9ms access, 512K cache, 7,200 RPM, 20MB/sec ST34572MB	ST34572MB	\$649.99
9150MB SCSI Cleverah, 8ms access, 512K cache, 10,000 RPM, 40MB/sec ST39150MB	ST39150MB	\$1,349.99
23400MB SCSI Elio 23, 13ms access, 2,048K cache, 5,400 RPM, 40MB/sec ST42340MB	ST42340MB	\$2,499.99

NOTEBOOKS

Toshiba	Model	Price
Likemito 50C, 75MHz Pentium®, 6.1" TFT, 16MB RAM, 810MB HDD T50C	Likemito 50C	\$1,929.99
Satellite Pro 220CDS, 133MHz Pentium®, 12.1" DSTN, 16MB RAM, 1.34GB HDD, 10X T4220CDS	Satellite Pro 220CDS	\$1,899.99
Satellite Pro 440C, 133MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 1.4GB HDD, 10X T440C	Satellite Pro 440C	\$2,359.99
Satellite Pro 440C, 133MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 1.4GB HDD, 10X T440C	Satellite Pro 440C	\$2,359.99
Satellite Pro 440C, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD, 10X T440C	Satellite Pro 440C	\$3,659.99
Portege 300C, 133MHz Pentium® MMX™, 10.4" TFT, 32MB RAM, 1.51GB HDD T4300C	Portege 300C	\$3,699.99
Toshiba 510C, 133MHz Pentium®, 12.1" TFT, 16MB RAM, 2.1GB HDD, 10X T4510C	Toshiba 510C	\$2,699.99
Toshiba 520C, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.0GB HDD, 10X T4520C	Toshiba 520C	\$4,159.99
Toshiba 530C, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.0GB HDD, 10X T4530C	Toshiba 530C	\$4,579.99
Toshiba 730C, 150MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 2.0GB HDD, 10X T4730C	Toshiba 730C	\$3,299.99
Toshiba 740C, 166MHz Pentium® MMX™, 13.3" TFT, 16MB RAM, 2.0GB HDD, 10X T4740C	Toshiba 740C	\$4,659.99
Toshiba 740C, 166MHz Pentium® MMX™, 13.3" TFT, 16MB RAM, 3.0GB HDD, 10X T4740C	Toshiba 740C	\$4,849.99
Toshiba 740C, 166MHz Pentium® MMX™, 13.3" TFT, 16MB RAM, 3.0GB HDD, 10X T4740C	Toshiba 740C	\$4,999.99

IBM	Model	Price
ThinkPad 380, 150MHz Pentium®, 12.1" DSTN, 16MB RAM, 1.0GB HDD H7263510	ThinkPad 380	\$1,729.99
ThinkPad 380, 150MHz Pentium®, 12.1" DSTN, 16MB RAM, 1.3GB HDD, 8X H7263520	ThinkPad 380	\$1,999.99
ThinkPad 380, 150MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 2.1GB HDD, 8X H7263530	ThinkPad 380	\$3,099.99
ThinkPad 560, 133MHz Pentium®, 11.3" DSTN, 8MB RAM, 2.1GB HDD H7264010	ThinkPad 560	\$1,699.99
ThinkPad 560, 133MHz Pentium®, 12.1" TFT, 8MB RAM, 2.1GB HDD H7264020	ThinkPad 560	\$2,899.99
ThinkPad 560, 150MHz Pentium® MMX™, 11.3" DSTN, 16MB RAM, 2.1GB HDD H7264030	ThinkPad 560	\$2,999.99
ThinkPad 560, 166MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 2.1GB HDD H7264040	ThinkPad 560	\$4,189.99
ThinkPad 760X, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 1.0GB HDD, 8X H754609	ThinkPad 760X	\$3,699.99
ThinkPad 760X, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD H754709	ThinkPad 760X	\$3,849.99
ThinkPad 760X, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD H754709	ThinkPad 760X	\$3,989.99
ThinkPad 760X, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 3.0GB HDD H754709	ThinkPad 760X	\$5,299.99
ThinkPad 760X, 166MHz Pentium® MMX™, 13.3" TFT, 32MB RAM, 3.0GB HDD, 8X H754609	ThinkPad 760X	\$5,699.99

Compaq	Model	Price
Armada 1530DM, 133MHz Pentium® MMX™, 12.1" DSTN, 16MB RAM, 1.4GB HDD, 10X 304950-005	Armada 1530DM	\$2,499.99
Armada 1530DM, 133MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 1.4GB HDD, 10X 255150-005	Armada 1530DM	\$2,999.99
Armada 1580DM, 150MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 2.1GB HDD, 10X 291550-005	Armada 1580DM	\$3,499.99
Armada 4131T, 133MHz Pentium®, 12.1" TFT, 16MB RAM, 1.4GB HDD 259300-001	Armada 4131T	\$2,849.99
Armada 7330T, 150MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 2.1GB HDD 873150-004	Armada 7330T	\$3,799.99
Armada 7350M, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD 273140-004	Armada 7350M	\$4,499.99
Armada 7710M, 150MHz Pentium® MMX™, 12.1" TFT, 16MB RAM, 1.6GB HDD 220070-002	Armada 7710M	\$3,699.99
Armada 7730M, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD 277060-003	Armada 7730M	\$4,399.99
Armada 7750M, 166MHz Pentium® MMX™, 12.1" TFT, 32MB RAM, 2.1GB HDD 220060-003	Armada 7750M	\$4,999.99

ETHERNET ADAPTERS & PRINT SERVERS

3Com	Model	Price
Fast EtherLink XL, TP, PCI NWK5W5X	Fast EtherLink XL	\$89.99
EtherLink III, ISA, 10Base-T (10Base-2, RJ-45 only) NWK50YTP	EtherLink III	\$9.99
EtherLink III, ISA, 10Base-T (10Base-2, BNC, RJ-45) NWK50YTP	EtherLink III	\$9.99
Fast EtherLink XL, Cardbus, PCMCIA 3C604950	Fast EtherLink XL	\$153.99
Fast EtherLink XL, Cardbus, 3C604950	Fast EtherLink XL	\$153.99
EtherLink III LAN+33.6 F/M, PCMCIA 3C604950	EtherLink III	\$244.99
EtherLink III, TP, PCMCIA 3C604950	EtherLink III	\$129.99

Intel	Model	Price
EtherExpress PRO/10+, TP, ISA NWK50220	EtherExpress PRO/10+	\$57.99
EtherExpress PRO/10+, TP, PCI NWK50220	EtherExpress PRO/10+	\$79.99
EtherExpress PRO/100, TP, PCI NWK50460	EtherExpress PRO/100	\$79.99
EtherExpress PRO/100, PCMCIA 3C604950	EtherExpress PRO/100	\$159.99
NetPortExpress PRO/100, 3 ports NWK50451	NetPortExpress PRO/100	\$379.99
NetPortExpress PRO/100, 1 port NWK50451	NetPortExpress PRO/100	\$249.99

CIRCLE 278 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



DJ700 17" Monitor
 • 17"/16.1" screen/viewable size
 • Flat square technology CRT
 • 26mm dot pitch; 1024 x 768 @ 85Hz
 • JAG™ On-Screen display
 • 3 year manufacturer's warranty



\$2499.99
 304950-005

Armada 1530DM Notebook
 • 133MHz Pentium® processor with MMX™ technology
 • 12.1" Dual Scan display
 • 16MB EDO DRAM (80MB max)
 • 1.35GB SMART hdd; 10X CD-ROM

In Touch with Tomorrow
TOSHIBA



\$1399.99
 TODT7202U

Infinito 7202 Mini-Tower
 • 200MHz Pentium® processor with MMX™ technology
 • 132MB SDRAM (256MB max)
 • 4.0GB hdd; 2MB SGRAM video
 • 16X CD-ROM; 56K data/fax/voice
 • InTouch™ access module

PCTech Ask Our Advisors

```
Sub MAIN
On Error Goto ToggleOther
ToolsMacro .Name = "FileOpenAny", .Rename, .NewName = "FileOpen"
ToolsCustomizeMenus .Category = 2, .Name = "FileOpenAnyToggle",
.Menu = "File", .MenuText = "Toggle Open to &File Open",
.Rename, .Context = 0
Goto Finish
ToggleOther:
On Error Goto Finish
ToolsMacro .Name = "FileOpen", .Rename, .NewName = "FileOpenAny"
ToolsCustomizeMenus .Category = 2, .Name = "FileOpenAnyToggle",
.Menu = "File", .MenuText = "Toggle Open to &File Open Any", .Rename,
.Context = 0
Finish:
End Sub
```

FIGURE 2: This macro will toggle the File Open menu item between running a macro named FileOpenAny and running the built-in FileOpen command.

Open to File Open" and "Toggle Open to File Open Any." Each name tells you what the macro is about to do.

To create this macro, choose Tools | Macro, enter the name FileOpenAnyToggle, choose Create, and type the text into the macro editing window. (Note that Word will automatically add the Sub MAIN and End Sub statements when it opens the window.) Choose File | Close, and answer Yes when Word asks whether to keep the changes.

Next, you need to add a new item to the File menu. Choose Tools | Customize, then Menus. In the Categories list, choose Macros. In the Macros list, choose FileOpenAnyToggle. Then in the Change What Menu box choose &File, pick any position you like in the Position on Menu box and, assuming Word is currently set to use a macro for File | Open rather than the built-in command, enter the Name On Menu as Toggle Open to &File Open. (The ampersand before the F designates F as the trigger key that will choose this item on the menu.) Choose Add to add the menu item, then close the dialog box and choose File | Save All to save the changes to disk.

You will now find a new menu item on the File menu called Toggle Open to File Open. Choose it to run the macro. Here's how it works, starting with the first time you run it:

The On Error statement at the start of the macro tells Word to jump to the ToggleOther: label if it hits an error—which it will if it can't find a macro named FileOpenAny in the next step. Since we're assuming that the macro in question is currently named FileOpen, Word will jump to the ToggleOther: label.

The next On Error statement tells Word to jump to the Finish: label if it finds an error from this point on. The ToolsMacro command

then renames the FileOpen macro to FileOpenAny—which means Word won't run it when you choose File | Open. The ToolsCustomizeMenus command looks for the File menu item that runs the macro called FileOpenAnyToggle and changes the name of the menu item to "Toggle Open to File Open Any." The new name tells you what Word will do the next time you run the macro. Choose File | Open at this point and you'll run the built-in FileOpen command.

If you run the macro again, it won't find an error when it looks for a macro named FileOpenAny, so it will rename that macro back to FileOpen. That means it won't skip the first ToolsCustomizeMenus command, which renames the menu item for the toggling macro itself back to "Toggle Open to File Open." Here again, the new name tells you what the macro will do the next time you run it. Choose File | Open now and you'll run the macro that's currently named FileOpen.

—M. David Stone

SPREADSHEETS

Finding the Highest Values in a Range

I am trying to find a way to get the top (highest) three cells out of four columns and put these values in a fifth column. Is there a simple way to do this in Excel?

RAJEEV KASHYAP
via the Internet

PC MAGAZINE: Yes, you can use the LARGE function. LARGE works like MAX and MIN, except that it finds the *n*th-largest value in a range. For example, to get the fifteenth-largest num-

ber in cells A1:C1000, you'd write

=LARGE(A1:C1000,15)

Your fifth column, therefore, would include the formulas

=LARGE(range,1)

=LARGE(range,2)

and so on. For the first of these formulas, of course, you could substitute =MAX(range).

—Craig Stinson

Pasting Links with Intact Formatting

I use a simple Excel 95 spreadsheet to keep track of my car's maintenance, gas mileage, oil changes, etc. I enter the current date, time, mileage and number of gallons and then calculate the number of miles since the last fill-up, gas mileage, and time between fill-ups. I also keep track of the individual best gas mileage and total expenditures for the current sheet.

After I have enough entries to fill a single screen, I just copy the last entry of that sheet as a link to the first line of the new sheet. This way, if I change an entry on a previous sheet, the new data is propagated to the next sheet automatically. This works fine except for one problem. Every time I paste the last entry to the new sheet's first line, I get the correct data, but I lose the formatting of the date, time, and numeric data fields. When I do the paste, I choose the Paste Special command with the All option and Copy as Link, but the formatting still gets lost.

How can I retain the formatting?

KENN LEE
via the Internet

PC MAGAZINE: It's frustrating. If you do a simple copy and paste, your copied data retains its formatting. If you copy and paste-link, you get data only. The best way to deal with this is to add Excel's Paste Formats tool to your toolbar. Immediately after you do your paste-link, your copied data remains on the Clipboard. Click on the Paste Formats tool and the appropriate formatting appears.

To modify your toolbar, right-click it and choose Customize. Find the Paste Formats tool, drag it to the toolbar, and dismiss the Customize dialog box.

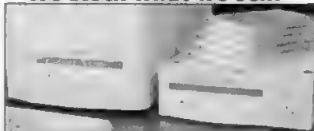
If you switch to Excel 97, you'll be able to put the Paste Special command itself, as well as the Paste Formats tool, on the toolbar. This will simplify the job of creating your link in the first place.—Craig Stinson



DIRT CHEAP DRIVES

1-800-786-1173

Celebrating our 10th year!
Low Low Prices!
We stock what we sell!



BEST BUY CD RECORDERS
TOLL FREE SUPPORT
5 FREE DISKS

- 2x6 SCSI CD ROM RECORDER**
- Packet write compatible • Sony mechanism
 - Caddy loading
 - Drive Kit \$339
 - Complete Kit with ISA controller \$389
 - Complete Kit with PCI controller \$449
- 4x6 SCSI CD ROM RECORDER**
- Packet write compatible • Yamaha mechanism
 - Choose tray or caddy loading
 - Drive Kit \$509
 - Complete Kit with ISA controller \$559
 - Complete Kit with PCI controller \$619
- 2x6 IDE CD ROM RECORDER**
- Packet write compatible • Sony mechanism
 - Tray Loading
 - Drive Kit \$379
 - Complete Kit with ISA controller \$399
- 2x6 SCSI CD ReWritable**
- CD-R & CD-RW compatible • Ricoh mechanism
 - Includes 5 rewritable disks • 2MB version +\$50
 - Drive Kit \$549
 - Complete Kit with ISA controller \$599
 - Complete Kit with PCI controller \$659
- (Add \$90 for external version. Drive kit - requires controller)

- We will not be undersold on CD media!**
- | CDR-74 (with jewel case) | Alone | with CDR |
|--------------------------|-------|----------|
| 5 pack (CDR74-5) | \$24 | \$21 |
| 20 pack (CDR74-20) | \$63 | \$58 |
| 50 pack (CDR74-50) | \$145 | \$135 |
| 100 pack (CDR74-100) | \$264 | \$254 |
- Printable Media for 50¢ more per disk!**
CDR Media Color Printer \$1129
- | CDR-74W (ReWritable) | Alone | with CDR |
|----------------------|-------|----------|
| 5 pack (CDR74W-5) | \$110 | \$106 |
| 20 pack (CDR74W-20) | \$382 | \$372 |



Converts any 3 1/2" hard drive into a removable drive. Great for transportability, data interchange, or security needs. Mount any 3.5" IDE or SCSI drive in the supplied cartridge, and the frame in a 5.25" drive bay in your computer and you are ready for transportability. Extremely high quality construction. Features built in cooling fan, SCSI ID switch

IDE	\$79	\$49	\$39
SCSI	\$85	\$54	\$40
WIDE SCSI	\$129	\$75	\$64

Weather resistant cartridge carrying case \$30



Hard Drive	Parallel	PCMCIA
2.5GB	\$289	\$389
3GB	\$319	\$419
4GB	\$369	\$469
5GB	\$459	\$559

CD ROM 24X \$159 \$279

DVD

- Supports CDR, and CDRW media
- IDE interface
- DVD-2 Reader, 150ms
- 20X CD ROM, 90ms

Bare Drive \$249
Drive with PCI DVD/MPEG-2 decoder \$459

IDE HARD DRIVES

IDE	RPM	Brand	Model	Price
1275MB	4500	Seagate	ST31277A	\$140
1281MB	5200	Western Digital	AC11200	\$152
1624MB	5200	Western Digital	AC21600	\$160
1700MB	4500	Seagate	ST31720A	\$153
1750MB	4480	Maxtor	M81750A	\$173
1750MB	5400	Fujitsu	MPA3017A	\$157
2000MB	4500	JTS	JTS2000	\$170
2000MB	5200	Western Digital	AC22000	\$177
2100MB	4480	Maxtor	M82100A	\$180
2152MB	4500	Seagate	ST32132A	\$170
2500MB	5200	Micropolis	MC4525A	\$175
2557MB	4500	Seagate	ST32531A	\$173
2559MB	5200	Western Digital	AC22500	\$197
2560MB	5400	Maxtor	M82560A	\$180
2620MB	5400	Fujitsu	MPA3026A	\$175
3000MB	4500	JTS	JTS3000	\$199
3166MB	5200	Western Digital	AC33100	\$209
3201MB	4480	Maxtor	M83201A	\$219
3245MB	4500	Seagate	ST33240A	\$195
3500MB	5400	Fujitsu	MPA3035A	\$194
4000MB	5200	Western Digital	AC34000	\$266
4000MB	5200	Micropolis	MC4540A	\$248
4320MB	4500	Seagate	ST34340A	\$260
4320MB	4480	Maxtor	M84320A	\$262
4320MB	3600	Quantum	BF4335A	\$211
4326MB	4500	Seagate	ST3436A	\$259
4328MB	5400	Fujitsu	MPA3043A	\$256
5000MB	5200	Micropolis	MC4550A	\$308
5120MB	5400	Maxtor	M85120A	\$337
5250MB	5400	Fujitsu	MPA3052A	\$319
6450MB	5400	Seagate	ST36450A	\$359
6480MB	3600	Quantum	BF6510A	\$315
7000MB	5200	Maxtor	M87000A	\$431

SCSI HARD DRIVES

Add a DPT 2044UB Ultra SCSI controller \$199

SCSI	RPM	Brand	Model	Price
1050MB	5400	Seagate	ST31055N	\$242
2150MB	5400	Seagate	ST52160N	\$229
2151MB	5400	Quantum	FB32160N	\$235
2160MB	7200	Seagate	ST32162N	\$425
2275MB	7200	Quantum	FB32275S	\$359
3228MB	5400	Quantum	FB3240S	\$299
4300MB	5400	Micropolis	MC4743	\$335
4310MB	5400	Quantum	FB34320S	\$345
4400MB	7200	Fujitsu	MC2954S	\$559
4550MB	7200	Micropolis	MC4345S	\$529
4550MB	7200	Micropolis	MC4345AV	\$595
4550MB	7200	Seagate	ST34572N	\$619
4550MB	7200	Quantum	VK34550S	\$565
4550MB	7200	Quantum	XP34550S	\$665
4550MB	10,000	Seagate	ST34501N	\$715
6448MB	5400	Quantum	FB36480S	\$449
9100MB	7200	Micropolis	MC3391	\$909
9100MB	7200	Fujitsu	MC2949S	\$979
9100MB	7200	Quantum	XP39100S	\$969
9100MB	7200	Micropolis	MC3391AV	\$969
9100MB	7200	Seagate	ST19171N	\$989
9100MB	10,000	Seagate	ST19101N	\$1139
23300MB	5400	Seagate	ST423451N	\$1899

WIDE HARD DRIVES

Add a DPT 2044UNB Ultra Wide SCSI controller for \$249

WIDE	RPM	Brand	Model	Price
1050MB	5411	Seagate	ST31055W	\$329
2160MB	7200	Seagate	ST32272W	\$459
2275MB	7200	Quantum	VK32275W	\$359
4300MB	5400	Micropolis	MC4743W	\$335
4400MB	7200	Fujitsu	M2954W	\$569
4550MB	7200	Micropolis	MC4345W	\$555
4550MB	7200	Micropolis	MC4345WAV	\$619
4550MB	7200	Seagate	ST34572W	\$659
4550MB	7200	Quantum	VK34550W	\$565
4550MB	7200	Quantum	XP34550W	\$669
4550MB	10,000	Seagate	ST34501W	\$759
9091MB	5400	Micropolis	MC3391W	\$929
9091MB	5400	Micropolis	MC3391WAV	\$990
9100MB	7200	Fujitsu	M2949W	\$1019
9100MB	7200	Quantum	XP39100W	\$969
9100MB	7200	Seagate	ST19171W	\$1029
9100MB	10,000	Seagate	ST19101W	\$1179
23300MB	5400	Seagate	ST423451W	\$1949

KEEP IT COOL!



Hard Drive Cooling Fan Mounts in a 5 1/4 half height drive bay. Compatible with any 3 1/2" hard drive. Features twin cooling fans and a washable air filter. A must for 7200 and 10,000 RPM drives. (CHDFAN) \$30

CD ROM DRIVES

IDE CD ROM	Speed	Brand	Model	ms	Int
12X	CyberDrive	CYBER12X	150	\$69	
16X	Mitsumi	CMRFX16X	120	\$92	
16X	NEC	CDR1600	100	\$89	
20X	Lite On	LTN202A	120	\$88	
24X	Panasonic	CR585	85	\$100	
24X	Mitsumi	CMRFX24X	90	\$102	
24X	Toshiba	XM6102B	85	\$101	

IDE CD CHANGERS

Speed	Brand	Model	# Disks	Int
6X	NEC	CDR4X6	4	\$99
8X	NEC	CDR4X8	4	\$105
12X	Panasonic	SQTC512N	5	\$266

ACCESSORIES

Buy a CD drive & sound card & get a FREE audio cable.
Creative Labs Sound Blaster 16 Value PnP (SBIDE) \$69
Creative Labs Sound Blaster AWE64 (SB64AWE) \$100
Creative Labs Sound Blaster AWE64 (SB64AWEGLD) \$180
Professional speakers with Bose style swivel speakers and separate subwoofer.
25 Watt (SPEAKERIR) \$99 35 Watt (SPEAKERPRO) \$129
Universal sound cable (AUDIOMIX) \$9
Turn any IDE CD ROM into an external for parallel printer port (PPCASECD) \$89
Turn any IDE CD ROM into an external for PCMCIA port (PCMCIACASECD) \$189

SCSI CD ROM

Speed	Brand	Model	ms	Int
12X	Toshiba	XM5701B	115	\$139
12X	Plexstor	PX12TS(tray)	105	\$209
12X	Plexstor	PX12CS(caddy)	105	\$259
15X	Toshiba	XM3801B	99	\$149
16X	NEC	CDR1610	100	\$139
20X	Plexstor	PX20TS	95	\$229

SCSI CD CHANGERS

Speed	Brand	Model	# Disks	Int
16X	Nakamichi	MJS16	5	\$239

SCSI CD TOWERS

Speed	Brand	Model	# Disks	Int
15X	Toshiba	99ms	\$879	\$1479
16X	NEC	100ms	\$879	\$1479
20X	Plexstor	95ms	\$1299	\$2249

SCSI CD TOWERS w/ 5 Disc Changers

Nakamichi 16X 150ms \$1399 \$2399
Ethernet adapter option available. Call.

CD RECORDERS

- Sony 2x6**
Internal SCSI drive (CDU926S) \$309*
Yamaha 4x6
Internal SCSI drive tray load (YCDR400T) \$479*
Internal SCSI drive caddy load (YCDR400) \$489*
Ricoh 2x6 CD ReWritable
Internal SCSI drive 1MB, tray load (RO6200S) \$429*
Internal SCSI drive 2MB, caddy load (RO6201S) \$479*
Hewlett Packard SureStore 6020i
SureStore 6020i includes software, and 1 disk.
Internal SCSI (C4343CDR) \$369
Complete internal kit w/ controller (C4343CDR-1) \$409
External for parallel printer port (C4343A) \$545
Sony 2x6
Internal IDE (CDU928S) \$349*
Kit w/ 1 disk, and software compatible with Win 95 & Win NT 3.51 & up. Requires IDE controller. (CDU928SKIT) \$369
Mitsumi 2x6
IDE Kit includes 3 disks, and software compatible with Win 95 & Win NT 3.51 & up. Requires IDE controller. (CMRFX2600TE) \$405
*Drive must be purchased with CDR software or media.

ULTRA IDE HARD DRIVES

FUJITSU

1750MB	10ms	5400	MP3017U	3	\$162
2620MB	10ms	5400	MP3026U	3	\$180
3500MB	10ms	5400	MP3035U	3	\$202
4570MB	10ms	5400	MP3043U	3	\$265
5250MB	10ms	5400	MP3052U	3	\$325

QUANTUM

1614MB	10ms	5400	FB31620A	3	\$170
2151MB	10ms	5400	FB32160A	3	\$181
3228MB	10ms	5400	FB33240A	3	\$212
4310MB	10ms	5400	FB34320A	3	\$249
6448MB	10ms	5400	FB36480A	3	\$345

MAXTOR

7000MB	10ms	5200	M87000D	3	\$453
--------	------	------	---------	---	-------

SEAGATE

2111MB	12ms	4500	ST32122A	3	\$177
3227MB	12ms	4500	ST33232A	3	\$195
4303MB	12ms	4500	ST34342A	3	\$249

WESTERN DIGITAL

4304MB	11ms	5400	AC34300	3	\$290
5160MB	12ms	5400	AC35100	3	\$365

Premises PCI Ultra IDE Controller (LATA35) with drive \$50

We Can: Install any of these drives in external enclosures, and custom configure to your specifications.

TAPE DRIVES

EXABYTE

3.5-7Gig	8mm, 32MB/min, EXB8205XL	\$1169
7-14Gig	8mm, 120MB/min, ELIANT820	\$1519
7-14Gig	8mm, 60MB/min, EXB8700LT	\$679
7-14Gig	8mm, 60MB/min, EXB8700	\$919

(EXB8700 includes 1 tape 1 cleaning tape and backup software)

20-40Gig	8mm, 360MB/min, EXB8900	\$3679
70-140Gig	8mm, 60MB/min, EXB10H	\$4239

HEWLETT PACKARD

2Gig	DAT, 11MB/min, C1534AI	\$579
2-4Gig	DAT-DC, 42MB/min, C1536AI	\$609
4-8Gig	DOS-2 DAT, 60MB/min, C1599AI	\$799
12-24Gig	DOS-3 DAT, 120MB/min, C1554AI	\$1099
72-144G	DOS-3 DAT, 120MB/min, C5648A	\$2649

SEAGATE

2-4Gig	DAT-DC, 66MB/min, STD24000N	\$589
4Gig	Mini, 29MB/min, TST8000	\$339
4-8Gig	DOS-2 DAT, 66MB/min, STD28000N	\$759
12-24Gig	DOS-3 DAT, 132MB/min, STD224000N	\$1059

SEAGATE MINI CART

Prices include Dos/Win backup software & 1 tape

800MB	TR1, TST800R	\$89	Parallel ver	\$129
3.2Gig	TR3, TST3200	\$179	Parallel ver	\$185
4-8Gig	TR4, TST8000	IDE or SCSI		\$339

SONY \$20 rebate w/ hard drive purchase

4-8Gig	DOS-2 DAT, 44MB/min, SDT5000AI	\$689
4-8Gig	DOS-2 DAT, 90MB/min, SDT7000AI	\$759
12-24Gig	DOS-3 DAT, 144MB/min, SDT9000AI	\$1039
32-64Gig	DOS-2 DAT, 90MB/min, TSL7000X	\$2099

QUANTUM

15-30Gig	DLT, 150MB/min, DLT2000XT	\$2499
20-40Gig	DLT, 180MB/min, DLT4000	\$3239
75-150Gig	DLT loader, 150MB/min, DLT2500XT	\$4779
100-200Gig	DLT loader, 180MB/min, DLT4500	\$6219
105-210Gig	DLT loader, 150MB/min, DLT7000XT	\$6529
140-280Gig	DLT loader, 180MB/min, DLT4700	\$8099

REMOVABLE DRIVES

IONEMA 100MB ZIP	
Internal SCSI for PC (ZIP100)	\$145
Internal IDE for PC (ZIP100A)	\$139
External SCSI for PC or Mac (ZIP100)	\$145
External for PC parallel port (PPZIP100)	\$145
100MB disks (ZIP100C) Qty 2-9/Qty 10+	\$18/\$14

PCTech Ask Our Advisors

DATABASES

Autonum for Queries

Help! I'm sure there must be an easy way to do this but I can't find it. I use the Windows 95 version of Microsoft Access to run a dispatching database. As calls for service come in, they are logged into a dispatch table. At dispatch time, I use queries to separate the calls into their respective routes for the day. Those queries are then exported as .TXT files to my Alpha paging software for paging. The stops for each route need to be numbered on the page; for example, (01) Joe's place (02) Jim's place (03) Bob's place... etc.

Up to now, I have included a field in the query called "stop number" that I manually edit for each route and number from 1 to whatever. However, this is getting very tedious as I now have up to 40 routes with anywhere from 1 to 20 stops on each. Is there a way to let the query increment the stop number by itself, starting with 1 each time for each route? Basically, I need an "AutoCount" field in the query that will start with the number 1 every time.

P.S.: I find the "Ask Our Advisors" section of PC Magazine the most useful and now subscribe at work basically for that section only.

BOB VAN DYCK
via the Internet

PC MAGAZINE: You can use the QueryAutonum function shown in Figure 3 to add a counter column to your query output, but for it to work reliably, you should output the query result to a table. To use the function, you must add it to a module in your database. Select your query in the Database window and choose Design. Then select the Insert menu and choose Column. When the new column appears, type the following into the Field row, substituting an actual column from your table for [Address]:

```
StopNumber: QueryAutonum([Address],  
"Get")
```

Now save the changes to your query. When you run the query, you'll see the Stop-Number column in the datasheet that results. You'll also notice that anything that causes the window to repaint also causes the query to call the QueryAutonum function again, thereby changing the numbers in the Stop-Number column. This happens when you switch back and forth between windows, minimize and maximize, scroll and so on. It's because of this characteristic that I recommend you change the query to a Make-Table query to send the output to a table. That way

```
Function QueryAutonum(vField As Variant, sOp As String)  
'*****  
' Function QueryAutonum(vField As Variant, sOp As String)  
' Returns the next available number. This function is intended for use with  
' queries. vField should be a column in the query if you want the function  
' to be called more than once. sOp should be "Get" to get the next number,  
' or "Rst" to reset the number to zero.  
'*****  
Static lCounter As Long  
If sOp = "Get" Then lCounter = lCounter + 1 ' Increment the counter  
If sOp = "Rst" Then lCounter = 0 ' Reset the counter  
QueryAutonum = lCounter  
End Function
```

FIGURE 3: Use the QueryAutonum function to add an autonum column to your query result. This works best only when you output your query result to a table.

the numbers won't change.

To change your query to a Make-Table query, select the query in the Database window and choose Design. When the query appears select the Query menu and choose Make-Table Query, then enter a name for the table that will hold the query result (perhaps "Stop Number Output"). Press OK, then save the changes to the query.

Running the Make-Table query will send the query output to the named table, which will include the counter column. You can then export this table to a text file.

The QueryAutonum function takes two arguments. The first should be a field in your query. Even though the function does absolutely nothing with the field, you need to pass it because of the rules Access uses when it decides how often to process a custom function called from a query. The rules work like this: The function runs once per query if the expression doesn't reference a field, once per row if the expression references a field, and two times per row if the expression contains criteria. Therefore if you don't include a field as the first argument, the function will only be called once and the Stop Number will always be 1.

The second argument can be either Get or Rst. If it's Get, the function returns the next counter number. If it's Rst, the function resets the counter to zero. Because the function retains the current value of the counter throughout an Access session with your database, you'll want to call the function with the second argument set to Rst prior to running each query that uses it. That way the number will always start at 1.

The best way to automate this is to create a macro with three steps. First choose the Runcode action to run the QueryAutonum function to reset the counter value. Enter the following in the Function text box under Action Arguments:

```
QueryAutonum("", "Rst")
```

The second macro action uses the Open-Query action to run the Make-Table query. Enter the name of the Make-Table query in the Query name text box under Action Arguments.

For the third macro action, choose the OutputTo action to export the query result table to a .TXT file for use with your paging software. Under Action Arguments choose Table as the Object Type. Enter the name of the table created by your query under Object Name. Choose MS-DOS Txt as the Output Format and enter a name for the .TXT file under Output File. Then save and name the macro.

Running the macro will reset the counter to 0, create the table with the stop numbers, and output the table to the .TXT file.

—Sal Ricciardi

HOW TO CONTACT US--

Send your tips and questions to our advisors in any of the following ways:

E-MAIL pctech@zd.com

FAX 212-503-5799

MAIL Solutions, PC Magazine, One Park Ave., New York, NY 10016-5802 (Please send a floppy disk and a printout.)

COMPUSERVE To reach individual editors as listed on ZD Net, type GO PCMSTAFF.



If we print your tip, you'll receive \$50 plus a PC Magazine T-shirt. We regret that we cannot answer letters individually.

CELEBRATE AS PCs COMPLEAT JOINS THE NEW COMPUSA DIRECT.



COMPUSA
DIRECT

Superstore Savings Direct To You

1-800-670-9543
www.compusa.com

**GREAT
OFFERS
INSIDE!**

GRAND OPENING SPECIALS!

CALL WHILE SUPPLIES LAST!

THE COMPUSA DIRECT Advantage!

The service and experience of PCs Complete combined with the selection, support and incredible buying power of CompUSA Direct. We offer more than 130 store locations nationwide for: hassle-free drop-off technical service, product returns and exchanges.

- ✓ More than 50,000 products
- ✓ Knowledgeable, helpful service
- ✓ Guaranteed low pricing
- ✓ Same day shipping for second day delivery on in-stock items
- ✓ Professional on-site installation available at reasonable prices
- ✓ Custom configuration
- ✓ Free software installation with system purchase
- ✓ Toll-free technical support for hardware and software
- ✓ Hassle-free drop-off technical service at more than 130 CompUSA Computer Superstore locations nationwide
- ✓ On-site technical service available
- ✓ Technology Assurance Program™ support/repair coverage
- ✓ Computer and software training at CompUSA training facilities (See store for details)
- ✓ Flexible payment plans
- ✓ Money-back satisfaction guaranteed (Call for details)

NO PAYMENTS, NO INTEREST!
FOR 6 MONTHS

On everything we sell. No minimum purchase. Must be paid in full within 6 months from date of purchase. Offer valid until the next issue of this magazine or 60 days, whichever comes first. No Payments/No Interest Financing Details. Subject to credit approval. Applies to purchases made with the CompUSA consumer credit card. Accrued finance charges will be assessed from the original date of purchase if balance is not paid in full within six months. As of July 25, 1997, The CompUSA credit card annual percentage rate (APR) is 22.30%. APR's vary; minimum monthly finance charge of 1% may apply. Credit is provided by Beneficial National Bank USA.

THE NEW COMPUSA DIRECT
Superstore Savings Direct To You...
1-800-670-9543
www.compusa.com

YOUR CHOICE

\$300 INSTANT REBATES



TOSHIBA

Satellite Pro 440CDT

• 133MHz Pentium® Processor with MMX™ Technology • 1.4GB Hard Drive • 16MB RAM • 10X CD-ROM Drive • 12.1" Active-Matrix Display



Price Before Rebate

2999⁹⁵

Instant Rebate -300⁰⁰

2699⁹⁵

Price After Rebate
PA1241U-T2C
While supplies last.



HEWLETT PACKARD Pavilion

Pavilion 7320 Minitower Multimedia PC Remanufactured

• 166MHz Pentium® Processor with MMX™ Technology • 2.1GB Hard Drive • 16MB RAM • 16X CD-ROM Drive • 33.6/14.4 Data/Fax Modem



Price Before Rebate

1299⁹⁵

Instant Rebate -300⁰⁰

999⁹⁵

Price After Rebate
D3931A#ABA888
Monitor sold separately. While supplies last.

YOUR CHOICE

\$100 INSTANT REBATES



NEC

Ready Office 1620

• 133MHz Pentium® Processor • 2.1GB Hard Drive • 16MB RAM • 8X CD-ROM Drive • 33.6/14.4 Data/Fax Modem



INCLUDES 10GB ZIP DRIVE AND MICROSOFT OFFICE 97 PRO!

Price Before Rebate

899⁹⁵

Instant Rebate -100⁰⁰

799⁹⁵

Price After Rebate
102-00102
Monitor sold separately. While supplies last.



PiXie

17" Color Monitor

• 15.75" Viewable Image Size • 1280x1024 Resolution • Non-Glare Screen • .28mm Dot Pitch • Accepts Compaq and Packard Bell Speakers

Price Before Rebate

499⁹⁵

Instant Rebate -100⁰⁰

399⁹⁵

Price After Rebate
PBC7164

OFFERS AVAILABLE THROUGH MAIL ORDER AND THE INTERNET ONLY.

INCREDIBLE SAVINGS!

OVER 50,000 PRODUCTS AVAILABLE.

OFFERS
AVAILABLE
THROUGH MAIL
ORDER AND
INTERNET
ONLY.

**YOUR
CHOICE
\$50
INSTANT
REBATES**

brother

SPECIAL BUY!



**HL-720 Laser Printer
Remanufactured**

- 6ppm
- 600dpi Resolution
- 35 Scalable Fonts

Price Before Rebate
249⁹⁵
Instant Rebate
-50⁰⁰
199⁹⁵
Price After Rebate
HL-720-FR
While supplies last.

OLYMPUS



**D-200L Digital
Camera**

- 640x480 Resolution • 24-Bit Color Images • 2MB Built-In Memory • Stores 80 Normal Mode or 20 High-Quality images

Price Before Rebate
599⁹⁵
Instant Rebate
-50⁰⁰
549⁹⁵
Price After Rebate
D200L
While supplies last.

PHILIPS

**50% OFF
NEXT WINDOWS[®]
CE HANDHELD PC**



Velo Handheld PC

- Windows[®] CE • Pocket Word, Pocket Excel, and Pocket Internet
- Built-In 19.2Kbps Modem • Fax, E-mail and Connect to the Web

Price Before Rebate
639⁹⁵
Instant Rebate
-50⁰⁰
589⁹⁵
Price After Rebate
VC010202-US
While supplies last.

**YOUR
CHOICE
\$20
REBATES**



**Recordable
CDs, 10-Pack**

Price Before Rebate
49⁹⁵
Mfr. Mail-in Rebate
-20⁰⁰
29⁹⁵
Price After Rebate
622880
While supplies last.

Robotics



**Sportster 33.6
Internal Modem**

- 28.8Kbps Data Rate
- Backwards Compatible
- Full Five-Year Warranty

Price Before Rebate
69⁹⁵
Mfr. Mail-in Rebate
-20⁰⁰
49⁹⁵
Price After Rebate
001125-0
While supplies last.



**24X IDE CD-ROM
Drive Kit**

- Enhanced IDE interface
- 100ms Access Time
- 3600Kbps Transfer Rate
- 128KB Buffer Memory

Price Before Rebate
119⁹⁵
Mfr. Mail-in Rebate
-20⁰⁰
99⁹⁵
Price After Rebate
USA24A-00R
While supplies last.

Xircom



**10/100BaseT
PC Card Ethernet
Adapter**

- 10/100Mbps • Ethernet PC Card • Easily Connects to 10BT and 100BT Network • Plug and Play with Windows[®]95

Price Before Rebate
149⁹⁵
Instant Rebate
-20⁰⁰
129⁹⁵
Price After Rebate
CE3B-100BTX
While supplies last.

ElgerCom



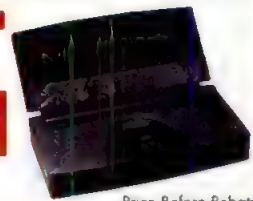
**56K* Modem with
10BaseT**

- PC Card
- K56* Flex

Price Before Rebate
159⁹⁵
Mfr. Mail-in Rebate
-20⁰⁰
139⁹⁵
Price After Rebate
EFX-5660PLBK
While supplies last.

Canon

**SPECIAL
BUY!**



**BJC-70
Bubble Jet Color Printer**

- 8ppm Color • 720x360 dpi Resolution • 20 Scalable TrueType Fonts

Price Before Rebate
199⁹⁵
Instant Rebate
-20⁰⁰
179⁹⁵
Price After Rebate
Q30-1200-325-FR
While supplies last.

FREE* AFTER REBATE



KAO

**3.5" Diskettes,
50-Pack**

*FREE after
Manufacturer
Mail-In Rebate.

Price Before Rebate
15⁰⁰
Mfr. Mail-in Rebate
-15⁰⁰
0⁰⁰
Price After Rebate
1000012350
While supplies last.



**Today
Serial
Mouse**

Price Before Rebate
10⁰⁰
Mfr. Mail-in Rebate
-10⁰⁰
0⁰⁰
Price After Rebate
904213-001
While supplies last.

MOUSE
SYSTEMS



**104-Key
Keyboard**

Price Before Rebate
20⁰⁰
Mfr. Mail-in Rebate
-20⁰⁰
0⁰⁰
Price After Rebate
905256-001
While supplies last.

Valid 10/1-10/31

**INCREDIBLE
MEMORY PRICES!**

**16MB SIMM 32MB SIMM
Memory Memory**

49⁹⁵ 99⁹⁵
4X32 8X32

**THE NEW
COMPUSA
DIRECT**

GET THE COMPUSA ADVANTAGE WITH
MORE THAN 130 STORES NATIONWIDE
FOR TECHNICAL SUPPORT AND SERVICES!

**1-800-670-9543
www.compusa.com**

CUSTOM CONFIGURE YOUR PC!

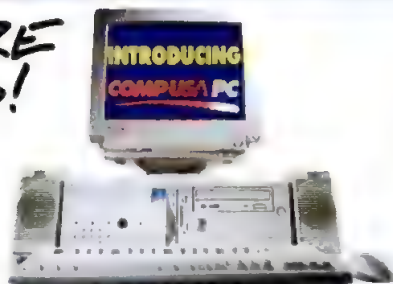
COMPUSA PC

LETS YOU CHOOSE THE OPTIONS YOU NEED!

CONFIGURE THIS!

MONITOR
CPU
MEMORY
HARD DRIVE
VIDEO
AUDIO
CD-ROM

MODEM
SPEAKERS
BACKUP
MOUSE
KEYBOARD
SOFTWARE



pentium

COMPUSA PC



pentium II



COMPUSA PC

American

• 166MHz Pentium® Processor with MMX™ Technology • 2.0GB Hard Drive • 16MB RAM • 16X CD-ROM Drive • 14" Color Monitor (13.1" Viewable Image Size)

999⁹⁵

A166-B01

American Pro

• 300MHz Pentium® II Processor with MMX™ Technology • 5.2GB Hard Drive • 32MB RAM • 4MB 3-D Video RAM • 24X CD-ROM Drive • 17" Color Monitor (15.7" VIS)

2799⁹⁵

AP300L-B01

YOUR CHOICE ON BEST SELLER COMPUTERS!

HEWLETT PACKARD Pavilion

HP Pavilion 3100

• 166MHz Pentium® Processor with MMX™ Technology • 2.0GB E-IDE Hard Drive • 16MB RAM • 12X CD-ROM Drive with Altec Lansing Stereo Speakers

14" 20 Color Monitor (13.2" Viewable Image Size) D28135 249.97



999⁹⁵

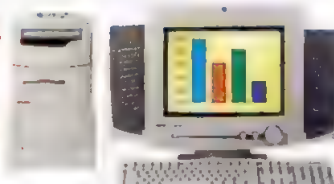
D5291A#ABA
Monitor sold separately.

COMPAQ

Presario 4504

• 200MHz Pentium® Processor • 2.1GB Hard Drive • 16MB RAM • 16X CD-ROM Drive • 33.6/14.4 Data/Fax Modem Upgradable to 56K

15" Color Monitor (13.5" Viewable Image Size) 241503-001 399.97



949⁹⁵

304300-003
Monitor sold separately

SHOP OUR WEBSITE AND CALL FOR OTHER INCREDIBLE DEALS!

TOSHIBA

Satellite 220CDS Remanufactured

• 133MHz Pentium® Processor • 1.4GB Hard Drive • 16MB RAM • 10X CD-ROM Drive



1699⁹⁵

PA1240U-S2CB

IBM



ThinkPad 770

• 233MHz Pentium® Processor with MMX™ Technology • 4.0GB Hard Drive • 32MB RAM



6499⁹⁵

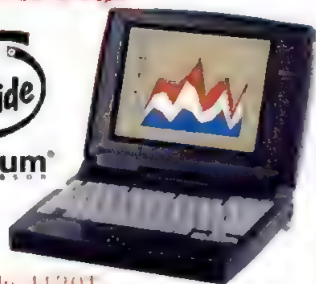
954830U

COMPAQ



Armada 41301

• 133MHz Pentium® Processor • 1.08 GB Hard Drive • 16MB RAM • 11.8" Active-Matrix Display



2499⁹⁵

228850-007

FUJITSU

FUJITSU PC CORPORATION



LifeBook 5351N

• 133MHz Pentium® Processor with MMX™ Technology 2.0 GB Hard Drive • 16MB RAM • 12.1" Active-Matrix Display



2799⁹⁵

FPC050162

SONY



VAIO PCG-707C

• 166MHz Pentium® Processor with MMX™ Technology • 2.1GB Hard Drive • 32MB RAM



4499⁹⁵

PCG-707C

THE NEW COMPUSA DIRECT

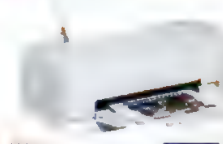
GET THE COMPUSA ADVANTAGE WITH MORE THAN 130 STORES NATIONWIDE FOR TECHNICAL SUPPORT AND SERVICES!

1-800-670-9543
www.compusa.com

POWER BUYS!

INCREDIBLE VALUES ON SCANNERS AND PRINTERS!

EPSON



Stylus Color 800 InkJet Printer
 • 1440x720dpi Photo-Quality Color and Laser-Quality Black • Up to 8ppm Black Text and 7 ppm Color • PC and Mac® Compatible

Price Before Rebate **449⁹⁵**
 Price Break **-50⁰⁰**
399⁹⁵
 C202011

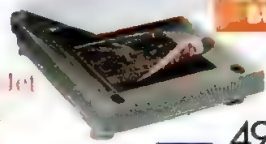
NEC



SuperScript 860 Laser Printer
 • 8ppm • 600dpi with NEC Sharp Edge Technology

Price Before Rebate **399⁹⁵**
 Mfr. Mail-in Rebate **-50⁰⁰**
349⁹⁵
 Price After Rebate **860**

HP HEWLETT PACKARD



HP ScanJet HP Color Scanner
 • 1200dpi Enhanced and 300dpi Optical Resolution • 24-Bit Color • Scan Speeds: 7.5 Seconds Black and White, 15 Seconds Color

Price Before Rebate **499⁹⁵**
 Price Break **-300⁰⁰**
199⁹⁵
 C1137A#ABA

Maxtor



3.0GB Internal Hard Drive with E-IDE Interface

Price Before Rebate **209⁹⁵**
 Mfr. Mail-in Rebate **-30⁰⁰**
179⁹⁵
 Price After Rebate **K0883000A**

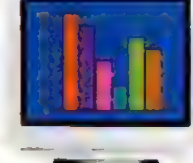


Iomega Zip Drive and Exclusive Offer from CompUSA
 Also get the 3-Pack of Zip Diskettes for only **49⁹⁵**
 10021



Price Before Rebate **149⁹⁵**
 CompUSA Mail-in Rebate **-50⁰⁰**
99⁹⁵
 Price After Rebate **10012IOMEGA**

HITACHI



Super Scan Lite 751 19" Monitor
 • 18" Viewable Image Size • 1600x1200 Resolution • .22mm Horizontal Dot Pitch

Price Before Rebate **1099⁹⁵**
 Instant Rebate **-100⁰⁰**
999⁹⁵
 Price After Rebate **CN751**

Megahertz



PC Card
 28.8 Kbps Data Fax Modem

Price Before Rebate **149⁹⁵**
 Price Break **-80⁰⁰**
69⁹⁵
 Remanufactured **XJ2288B**

Kingston



Turbo Chip 133 Processor
 Upgrade For 486 Systems
 • Increase Performance

Price Before Rebate **129⁹⁵**
 Price Break **-40⁰⁰**
89⁹⁵
 TC5X86/133

ATI



APT 6 Play 1MB Graphics Accelerator
 Immerse yourself in incredible 3D gaming.

Price Before Rebate **219⁹⁵**
 Price Break **-40⁰⁰**
179⁹⁵
 100-409017

NEW!



DX-5 Digital Camera
 • Automatic Pop-up Flash • Optical Viewfinder • 640x480 Resolution

Price Before Rebate **299⁹⁵**
 Price Break **-40⁰⁰**
259⁹⁵
 43853001

Logitech



First Mouse
 • 100% Microsoft IntelliMouse Compatibility • Functions as a Wheel to Scroll as Well as a Button

Price Before Rebate **29⁹⁵**
 Price Break **-40⁰⁰**
25⁹⁵
 911428-0403

CIRQUE



Input Center
 Four Powerful Tools in One
 Powerful Control Center!

Price Before Rebate **79⁹⁵**
 Mfr. Mail-in Rebate **-30⁰⁰**
49⁹⁵
 Price After Rebate **CIC360**

SYMANTEC



pcAnywhere
 • The Fastest and Easiest Access to Your Office PC from Anywhere

Price Before Rebate **129⁹⁵**
 Price Break **-40⁰⁰**
89⁹⁵
 07-00-02077

NEW!



Nuts & Bolts
 • Clean Up, Speed Up and Tune Up your Windows® Based Computer

Price Before Rebate **39⁹⁵**
 Price Break **-40⁰⁰**
35⁹⁵
 NB1

We'll beat any legitimate price in the current issue of this magazine on every product we sell. CompUSA Direct prices are available through mail order and the Internet and are valid until the next issue of this magazine, or 30 days from the date of this issue, whichever comes first. Our low price guarantee pertains to new, factory sealed products of the same brand and model number that are available and in stock at any local authorized retail store. Our guarantee does not apply to competitors' one-of-a-kind or other limited-quantity offers, special financing, installation, manufacturer's rebate, or when a bonus or free offer is included in the purchase. Prices and specifications are subject to change without notice. We reserve the right to limit quantities. Any typographical, photographic, or production error in products, pricing or offers is subject to correction. Due to manufacturers' restrictions, certain products may not be eligible for international shipment, and certain products may not be available at retail stores. Monitor displays are simulated. Pentium and the Intel Inside and Pentium Processor logos are registered trademarks and MMX is a trademark of the Intel Corporation. Windows is a registered trademark of Microsoft in the U.S. and other countries. Packard Bell is a registered trademark of Packard Bell Electronics, Inc. IBM is a registered trademark and Aptiva and Total Image Video are trademarks of International Business Machines Corporation, used under license therefrom. All trademarks are the property of their respective companies. Items other than software, returned within ten (10) days from the date of purchase with the original receipt or invoice, are eligible for refund or exchange. Unopened software may be returned within thirty (30) days for refund or exchange. Opened software may be returned for exchange only within ten (10) days from the date of purchase. A restocking fee will be charged on all returned items with missing boxes or packaging and returned printers with installed toner or inkjet cartridges. Refunds on purchases made with a credit card will only be credited to the same card. *In Connecticut only, instant rather than mail-in rebate. Superstore Savings Direct To You, CompPrice, The Low Price Period and America's Largest Computer Superstore are service marks of CompUSA Management Company. CompUSA PC is a trademark and CompUSA and CompUSA Direct are registered trademarks of CompUSA Management Company. ©1997 CompUSA Management Company.

THE NEW COMPUSA DIRECT

GET THE COMPUSA ADVANTAGE WITH MORE THAN 130 STORES NATIONWIDE FOR TECHNICAL SUPPORT AND SERVICES!

1-800-670-9543
www.compusa.com

REPLACE YOUR HARD DRIVE, NOT YOUR NOTEBOOK.

INFINITY FEATURES

High Capacity

Available in sizes ranging from 1.44 to 3.08 GB

Removable

Plug and Play design.

Easy Installation

Includes EZ-Drive software from Micro House for easy, one-step installation.

Performance

Fast 16.6 megabytes per second average transfer rate.

Warranty

Backed by a 3 year warranty and lifetime toll-free technical support.

Compatibility

With DOS, Windows, Windows 95, Windows NT, and OS/2 Warp.

Quality

Solutions designed for use with IBM systems covered by your IBM on-site warranty.

Selection

Designed for use in the industry's most popular portable computers.

Reliability

300,000 hours MTTF and self diagnostic capability.

Transportability

Take all your large files on the road.

Paragon Memory

pm_sales@paragonmem.com
pm_tech@paragonmem.com
www.paragonmem.com
Phone: 714-643-8844
Fax: 714-643-8855



Infinity Storage Solutions from Paragon provide you with a removable replacement hard drive designed and engineered specifically for your portable computer allowing you to increase your storage capacity to as much as 3 gigabytes! Infinity Storage Solutions replace your notebook's internal hard disk so there are no external devices, disks, or power supplies to transport.

Infinity Storage Solutions are backed by a 3 year warranty and guaranteed compatible with all supported models. Paragon also provides toll-free technical support for the lifetime of your Infinity storage product. In addition, Infinity Storage Solutions designed for use with IBM ThinkPad models are also covered by your IBM on-site warranty.



Upgrade to Excellence

To Locate A
Dealer Near You,
Call Paragon.
[800] 643-8866

System Model to be Upgraded ...	1.44GB	2.16GB	3.08GB
AST			
ASCENTIA 800, 900, 910, 950	PMS-40A02014	PMS-40A02021	PMS-40A01000
POWEREDGE, PREMIUM EXEC SERIES	PMS-40A02014	PMS-40A02021	PMS-40A01000
COMPAQ			
CUE 5000	PCB-EL03014	PCB-EL03021	PCB-EL03000
CUE ELITE SERIES	PCB-EL03014	PCB-EL03021	PCB-EL03000
CONFURA A200	PCB-40A02014	PCB-40A02021	PCB-40A02000
CONFURA 425, 430, 410, 400, 325	PCB-40A02014	PCB-40A02021	PCB-40A02000
ARMADA 1100	PCB-40A02014	PCB-40A02021	PCB-40A02000
ARMADA 4100	PCB-40A01014	PCB-40A01021	PCB-40A01000
DELL			
DELL LATITUDE XP, XP, LM	PML-4A00014	PML-4A00021	PML-4A00000
IBM			
THINKPAD 740 SERIES	PMS-7500014	PMS-7500021	PMS-7500000
THINKPAD 760 SERIES	PMS-7500014	PMS-7500021	PMS-7500000
THINKPAD P55, P55, 750, 360, 355	PMS-7500014	PMS-7500021	PMS-7500000
THINKPAD 560, 365, 350	PMS-40A02014	PMS-40A02021	PMS-40A02000
NEC			
VERSA 2000, 4000, 6000 SERIES	PMS-7500014	PMS-7500021	PMS-7500000
VERSA 4000, 2500 SERIES	PMS-40A02014	PMS-40A02021	PMS-40A02000
VERSA E, M, P V	PMS-7500014	PMS-7500021	PMS-7500000
TOSHIBA			
TECRA 500, 510	PMS-7500014	PMS-7500021	PMS-7500000
TECRA 700, 710, 720, 730, 740	PMS-7500014	PMS-7500021	PMS-7500000
SATELLITE T4000, T4000, T4050	PMS-7500014	PMS-7500021	PMS-7500000
SATELLITE T4000, T2450, T2400	PMS-40A02014	PMS-40A02021	PMS-40A02000
T2130, T2110, T2100	PMS-40A02014	PMS-40A02021	PMS-40A02000
PORTEGA 410, T3400, T3400	PMS-40A02014	PMS-40A02021	PMS-40A02000
SATELLITE PRO 400, 410, 420, 430, 200, 120, T2155, T2150	PMS-40A02014	PMS-40A02021	PMS-40A02000

USA FLEX

800-777-2450
www.usaflex.com

PC Mail

800-555-6255
www.pcmall.com

TigerDirect

800-888-4437
www.tigerdirect.com

PC Zone

800-258-2088
www.pczon.com

Micro Warehouse

800-367-7080
www.microwarehouse.com

CIRCLE 014 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink
To Order, Contact One Of These Paragon Authorized Resellers.

*Average street price. ©2007 Paragon Memory Corporation. All specifications subject to change without notice. Infinity is a trademark of Paragon Memory Corporation. Trademarks and registered trademarks are properties of their respective companies.

Virtual Photo
Albums

Greeting Card
Design

Web Creation

Scan To E-mail

T-shirt Design
And Transfer

Scan To
Screen Saver

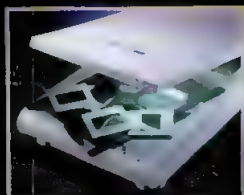
Morphing

Jigsaw Puzzles

And More



BE CREATIVE WITH YOUR PHOTO SCANNER



FotoTak-8

- True 600 dpi photo-realistic color
- Highest resolution of 4,800 dpi
- Small, A6 size
- Scan slides and converts negatives to positive image



The FunScan CD-ROM Software

- ISR ixlaphoto™
- MetaTools Kai's Power Goo™ Fusion SE
- Monotype Greeting Card Maker™
- Monotype T-shirt Design Maker™
- CMV & Sons Snap Shot™
- Argos Art Apart™

SPOT

The Smart Player of Technology
SPOT TECHNOLOGY INC.

<http://www.spotinc.com>

E-mail: webmaster@spotinc.com

COMDEX
Fall '97 1.8-2.3

The World's #1 Information Technology Marketplace
for Dealers and Corporate Decision Makers
November 17-21, 1997 Las Vegas, Nevada USA

• SPOT TECHNOLOGY INC.: 886-3-5878966 • SPOT IMAGE SCAN INC.: 1-800-611 SPOT/1-800-9693705 • Canada: 1-800-423-5400
• Germany: 49-2204-842850 • Japan: 81-03-3493 3588 • UK: 44-170-5322555

Blowout Prices on Leading Products!

Microwar

YOUR SOURCE FOR PC SOFTWARE,

IOMEGA ZIP DRIVE
ONLY **\$149⁹⁵!**
DMA002: Parallel
DMA1050: SCSI
DMA270: Insider



Now! HP LaserJet 5s/ix Printer
HEWLETT
PACKARD
\$352⁹⁵



MAGNAVOX
Magnavox 20" Monitor
\$699⁹⁵
1280 x 1024 resolution



IBM ThinkPad 380
As Low As **\$1749!**
PENTIUM®
PROCESSOR/MMX
1.6GB HDD/12.1" SVGA
DSTN DISPLAY



Extensa 610CD
• 150MHz Pentium® processor
• 1.4GB Hard Disk drive
• 16MB RAM EDO RAM
• 10X CD ROM drive
• 11.3" SVGA DSTN color display
CP4934
Acer
\$1799
TEXAS INSTRUMENTS



Presario 4504
200MHz Pentium® processor, 2.1GB, 16MB
RAM, 16X CD-ROM, Easy access buttons!
FOR ONLY **\$999!**
CP5379
COMPAQ



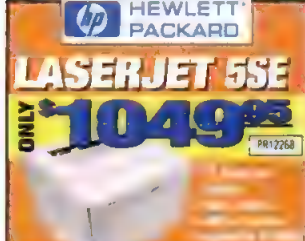
2.0GB HARD DRIVE KIT
Maxtor
FOR ONLY **\$179⁹⁵!**
DR6643
*Price reflects \$30
manufacturer's retail
price. Actual price
10/31/97. Ask for rebate
certificate A40318



COMPAQ
DESKPRO 4000
• 233MHz Pentium® II
processor
• 2.5GB hard drive
• 32MB RAM
• 8X CD-ROM
• 5 slots, 4 bays
CP5023
Only **\$2319!**
Includes Network Interface Card.
Monitor sold separately.



HEWLETT
PACKARD
LASERJET 5SE
ONLY **\$1049⁹⁵!**
PR1268



HEWLETT
PACKARD
FREE!
HP Small
Business
Value Pack
HP VECTRA 500
ONLY **\$1199!***
BM4237



COMPAQ
DESKPRO 2000
• 166MHz Pentium® MMX
• 2.1GB hard drive
• 16MB RAM
• 5 slots,
5 bays
desktop
Only **\$1199!**
Monitor sold separately.



COMPAQ
DeskPro 2000
Affordable and Manageable Desktop PC's
CP3378: 133MHz Pentium®, 16MB, 1.2GB, DT **\$979**
CP5248: 166MHz Pentium® MMX, 16MB,
2.1GB HDD, DT **\$1199**
CP5252: 200MHz Pentium® MMX, 16MB,
2.1GB HDD, DT **\$1389**
Desk Pro 4000
Best Value for Network Environments
CP5259: 166MHz Pentium® MMX, 16MB,
2.4GB HDD, DT **\$1399**
CP5256: 200MHz Pentium® MMX, 32MB,
2.4GB HDD, DT **\$1679**
CP5253: 333MHz Pentium® MMX, 32MB,
3.2GB HDD, 16X CD-ROM, MT **\$2129**
Desk Pro 6000
High Performance Network PC's
CP5022: 233MHz Pentium® II, 32MB
2.1GB SCSI HDD, PDCD Drive, DT **\$2629***
CP5024: 266MHz Pentium® II, 32MB,
4.2GB SCSI HDD, 8X CD-ROM, DT **\$3179***
*While supplies last!

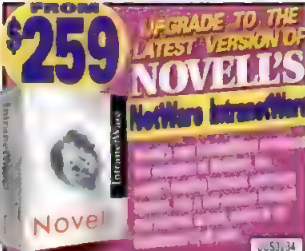
IBM
IBM Thinkpads
CP4775: 380, 150MHz Pentium®, 1.0GB, 16MB RAM,
12.1" DSTN **\$1749**
CP4773: 3800, 150MHz Pentium®, 1.35GB, 16MB,
8X CD-ROM, 12.1" DSTN **\$1999**
CP4774: 3800, 150MHz MMX Pentium®, 2.1GB, 16MB,
8X CD-ROM, 12.1" TFT **\$3299**
CP2907: 760EL, 120MHz Pentium®, 1.0GB, 8MB/72MB,
12.1" SVGA TFT **\$3199***
CP3558: 760E, 150MHz Pentium®, 2.1GB, 16MB/104MB,
12.1" XGA TFT **\$3499**
CP3557: 760EL, 133MHz Pentium®, 2.1GB,
16MB/80MB, 12.1" SVGA TFT **\$3829**
CP3559: 760CD, 133MHz Pentium®, 2.1GB, 16MB/104MB,
12.1" XGA TFT, 6X CD-ROM **\$3699**
CP4434: 760XL, 166MHz Pentium®, 2.1GB, 16MB,
12.1" TFT **\$3829**
CP4433: 760XL, 166MHz Pentium®, 2.1GB, 32MB,
12.1" TFT, WIN-NT **\$3999**
CP4435: 760CD, 166MHz Pentium®, 3GB, 32MB,
8X CD, 12.1" XGA TFT **\$4789**
*While supplies last!

TOSHIBA
Toshiba Laptops
CP5168: 220CDs, 133MHz Pentium®,
1.34GB HDD, 16MB RAM, 10X CD-ROM,
12.1" SVGA DSTN **\$1949**
CP5205: 500CT, 75MHz Pentium®,
772MB, 6.1" TFT, 1.8lbs. **\$1949**
CP5204: 300CT, 133MHz MMX, Pentium®,
1.51GB HDD, 33.6 Kbps, 10.4" TFT **\$3399**
CP5209: 440CD, 133MHz MMX Pentium®, 1.34GB HDD,
10X CD, 12.1" FAST SCAN **\$2399**
CP5210: 440CD, 133MHz MMX Pentium®, 1.34GB,
HDD, 12.1" TFT, 10X CD **\$3299**
CP5208: 460CD, 166MHz MMX Pentium®, 2.02GB HDD,
10X CD, 33.6 Kbps, 12.1" TFT **\$3799**
CP3217: 500CDT, 120MHz, 1.26GB HDD, 12.1" SVGA TFT,
6X CD **\$2399**
CP5206: 520CDT, 166MHz, 2.1GB HDD, 33.6,
12.1" TFT, 10X CD **\$4299**
CP5207: 530CDT, 166MHz MMX Pentium®, 2.1GB HDD,
33.6, 12.1" TFT, 10X CD **\$4699**
*While supplies last!

**HP LASERJET 6LSE
PRINTER**
FOR ONLY **\$399⁹⁵!**
PR12310
• Prints up to 6 ppm
• 600 x 600dpi
• HP's Resolution
Enhancement
technology for
smoother grays and
sharper blacks
HEWLETT
PACKARD



FROM \$259
UPGRADE TO THE
LATEST VERSION OF
NOVELL'S
NetWare IntranetWare
Novel



1440dpi Printing!
EPSON
\$299⁹⁵!
• Epson
• 5000 x 7500 dpi
• 100% inkjet
• 100% inkjet



**Microsoft Office 97
Standard Upgrade!**
Includes Word, Excel,
PowerPoint, and Outlook.
\$179⁹⁵!
S12442
*Price after Microsoft
\$40 rebate for version
upgrade. Price before
rebate is \$309.95.



- Visa and MasterCard accepted. Your credit card will not be charged until your order is shipped.
- Purchase orders subject to credit approval.
- All products covered by 30-day limited warranty. Defective software replaced immediately. Hardware replaced or repaired at our discretion.
- Connecticut, New Jersey, Illinois, Ohio, and Washington residents add applicable sales tax.
- Orders for in-stock items placed by 12:00 midnight (E) weekdays, (barring system failure, etc.) ship overnight by Airborne Express. (Some areas require an extra day).
- We reserve the right to limit quantities.
- Shipping charge \$9.95 per order up to 7 lbs. \$1.25 per lb. above 7 lbs.
- UPS ground service also available at current UPS rates plus \$2.95 handling charge per order except COD. UPS orders placed by 3:00 p.m. (E) weekdays, ship same day.
- Actual freight charges apply for computers, hard disks, Bernoulli's, tape backups, monitors, and printers.
- Alaska, Hawaii, outside continental U.S., APO/FPO call for information.
- Item availability and price subject to change without notice.
- Some products not available outside U.S. Please call for more information.
- Not responsible for errors or omissions.

WAREHOUSE

HARDWARE AND PERIPHERALS

COMPAQ ARMADA 4110



- 100MHz Pentium® Processor
 - 8MB RAM
 - 810MB Removable Hard Drive
 - Windows 95
 - 11.3" SVGA DSTN Color Display
 - 16-Bit Stereo Sound
 - Lithium Ion Battery
 - 3 Year Warranty
- Ask For Item # CP3225

ONLY \$999

VISIONBOOK PLUS 4140



- 133MHz Pentium® Processor
- 1.4GB HDD
- 16MB RAM
- 12.1" HA-STN display
- 10X CD-ROM
- 33.6 Kbps Modem

HITACHI CP5239

IBM THINKPAD 765D

- 166MHz MMX Pentium® Processor
- 32MB RAM
- 3GB Hard Drive
- 256KB Cache
- 13.3" XGA TFT color display
- 8X CD-ROM

ONLY \$6699

CP5040

TOSHIBA SATELLITE 220CDS

- 133MHz Pentium® processor
- 1.34GB hard disk drive
- 16MB EDO RAM
- 10X CD-ROM drive
- 12.1" SVGA DSTN display

ONLY \$1949

CP5166

TOSHIBA

SEAGATE MEDALIST™



3.2 GB IDE HARD DRIVE
ONLY \$249.95!

DR6333 Seagate

IONEGA JAZZ DRIVE



\$299.95!

HEWLETT PACKARD DESKJET 855CXI PRINTER



ONLY \$289.95*

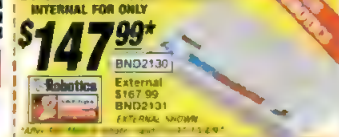
- PC/Mac compatible
- Up to 7 ppm black
- 600X600 DPI

LS-120 Diskette Drive from O.R. Technology



ONLY \$99.95!

SPORTSTER 56K MODEM



\$147.99*

CREATIVE PC-DVD



- Watch theater-style video
- Review up to 7 frames every data from standard CD-ROM
- Includes MPEG card!
- Listen to hi-fi audio

\$499.99!

D-200L DIGITAL CAMERA



OLYMPUS

ONLY \$599!

Storage Warehouse

SEAGATE HARD DRIVES (IDE)

DR5652	ST31276A	1275MB	\$179.95
DR5767	ST32132A	2113MB	\$199.95
DR5655	ST52520A	2560MB	\$219.95
DR6333	ST33240A	3240MB	\$249.95
DR6331	ST36450A	6450MB	\$479.95

WESTERN DIGITAL HARD DRIVES (IDE)

DR6112	Cavlar	11200, 1.2GB	\$179.95
DR5594	Cavlar	21600, 1.6GB	\$189.95
DR5595	Cavlar	22100, 2.1GB	\$209.95
DR5599	Cavlar	33100, 3.1GB	\$259.95
DR5972	Cavlar	34000, 4.0GB	\$339.95

IBM HARD DRIVES (IDE)

DR5732	Deskstar	2.1GB	\$239.95
DR5731	Deskstar	3.2GB	\$279.95

QUANTUM HARD DRIVES (IDE)

DR6544	Fireball ST	31620ST, 1.6GB	\$219.95
DR6543	Fireball ST	32160ST, 2.1GB	\$239.95
DR6542	Fireball ST	33240ST, 3.2GB	\$299.95
DR6541	Fireball ST	34320ST, 3.6GB	\$369.95
DR6524	Fireball ST	36480ST, 6.4GB	\$669.95

MAXTOR HARD DRIVES (IDE)

DR6089	Maxtor	K0182500A, 2.5GB	\$199.95*
DR5661	Maxtor	K0183500A, 3.5GB	\$249.95*
DR6390	Maxtor	K0184300A, 4.3GB	\$299.95*
DR5880	Maxtor	K0185120A, 5.1GB	\$349.95*
DR6557	Maxtor	K0187000A, 7.0GB	\$449.95*

*Price reflects \$30 manufacturer's mail-in rebate direct from Maxtor. Ask for rebate certificate A0018. Rebate expires 10/31/97.

MICROPOLIS HARD DRIVES (SCSI)

DR6091	4345NS	\$179.95
DR6089	4345WS, 4.5GB	\$179.95
DR6088	3391NS, 9.1GB	\$179.95
DR6093	3391WS, 9.1GB	\$1299.95

QUANTUM HARD DRIVES (SCSI)

DR6527	Fireball ST	32160ST, 2.1GB	\$319.95
DR6526	Fireball ST	33240ST, 3.2GB	\$399.95
DR6523	Fireball ST	3420ST, 4.3GB	\$529.95
DR6524	Fireball ST	36480ST, 6.4GB	\$669.95

SEAGATE HARD DRIVES (SCSI)

DR6719	ST32272N	2.2GB	\$549.95
DR6589	ST32272W	2.2GB	\$629.95
DR6539	ST34371N	4.3GB	\$749.95
DR6536	ST34371W	4.3GB	\$799.95
DR5641	ST19171N	9.1GB	\$1329.95
DR5637	ST19171W	9.1GB	\$1399.95

WESTERN DIGITAL HARD DRIVES(SCSI)

DR6103	W/D Enterprise	2.17GB	\$499.95
DR6106	W/D Enterprise	4.36GB	\$759.95

IONEGA DITTO TAPE DRIVES

DR5402	Ditto	2GB int.	\$119.95
DR5401	Ditto	2GB Ext.	\$169.95

IONEGA JAZZ DRIVE

DR4840	Internal, 1GB	\$299.95
DR1119	External, 1GB	\$399.95
ME6478	1.0GB Jazz Disk	\$124.95*

*Quantity pricing available

Free Catalog Subscription

Check the appropriate box(es) to receive a free, one-year subscription and mail this coupon to:
1720 Oak Street, P.O. Box 3014, Lakewood, N.J. 08701-3014

Name: _____
Address: _____ E-Mail: _____
City: _____ State: _____ Zip: _____

☐ MicroWAREHOUSE ☐ MicroSYSTEMS WAREHOUSE
☐ MacWAREHOUSE ☐ Data Comm WAREHOUSE

(Expect to receive your next issue within 4-6 weeks).

©Copyright 1997 MicroWarehouse, Inc. MacWAREHOUSE is a division of MicroWarehouse Inc. MicroWAREHOUSE and MicroWarehouse are registered trademarks of MicroWarehouse, Inc.

PPM7

To order, call toll-free 24 hours a day, 7 days a week

1-800-378-9159

On the Internet:
www.warehouse.com

Fax: 732-905-5245

Order until 12:00 midnight (E) weekdays for overnight delivery of "in stock" items — only \$9.95!

*Shipping charge \$9.95 per order up to 7 lbs. \$1.25 per lb. over 7lbs.

CALL FOR A FREE CATALOG!



CIRCLE 003 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM ProductLink

.....Play to **win**
and **save** yourself
some **money**....



Make the ultimate move for serious gamers who know the score when it comes to buying computer gaming magazines. Subscribe to Computer Gaming World now and save up to 47%!

Every monthly issue brings you exclusive first looks at the hottest, newest games... the latest in multimedia, CD-ROM and interactive environments. Plus winning strategies, master clues, in-depth reviews – all the help you need to pump up your system and play out your fantasies on this planet and beyond.

Score points and cosmic savings now with Computer Gaming World. We're worlds apart from any other computer game magazine.

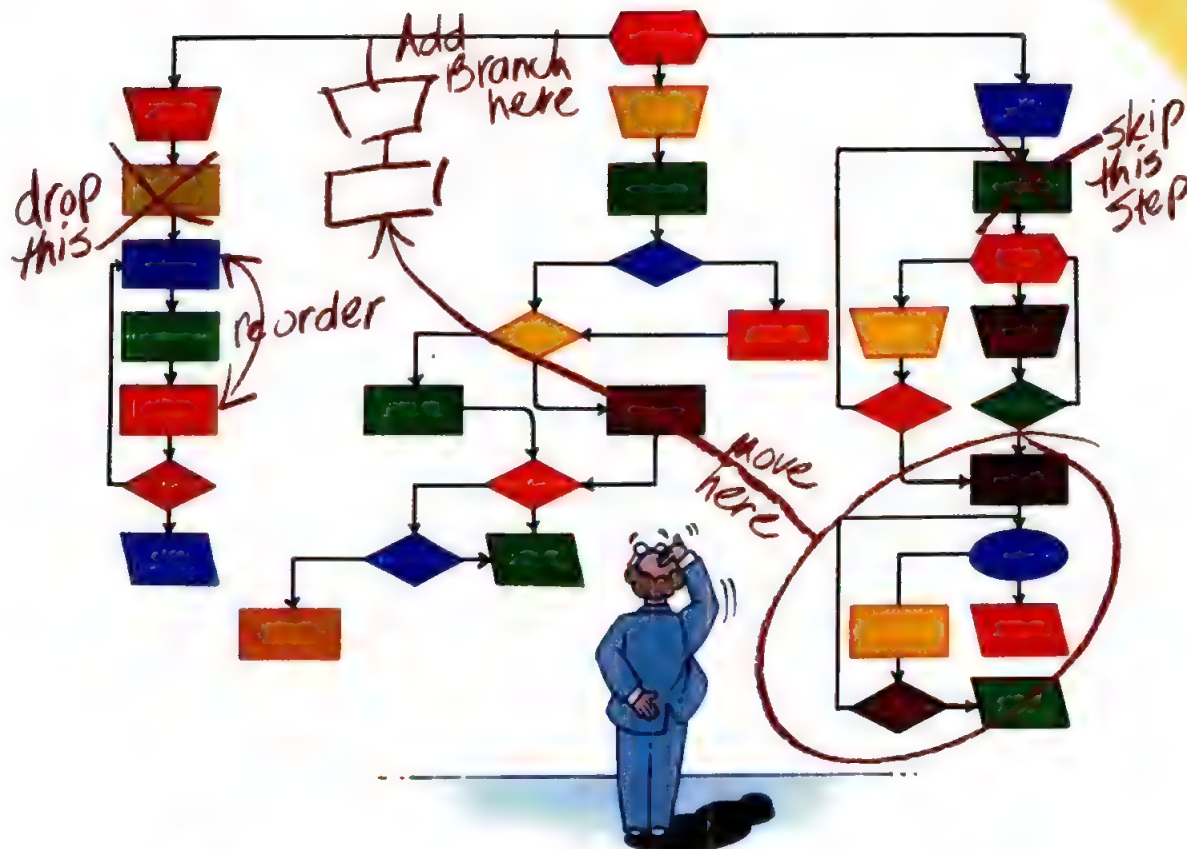
- One year/12 issues – \$27.94.
YOU SAVE 41%!
- Two years/24 issues – \$49.97.
YOU SAVE 47%!

Savings based on annual cover price of \$47.40.

CALL NOW TO SAVE UP TO 47%

1-800-827-4450

To ensure savings, mention this code to the operator who answers your call: 4Z95.



Fast flowcharts, instant revisions

Do more in less time

allCLEAR, the Smarter Flowcharter, helps everyone in your organization work smarter. In addition to documenting processes, it helps you think through the logic of your processes, communicate effectively, train people on procedures and much more. Use allCLEAR throughout your organization for:

- Quality management
- Audit documentation
- ISO/QS 9000 certification
- Business process reengineering
- Systems design
- Training and more

Create charts easily

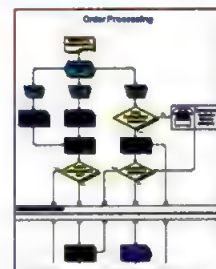
allCLEAR creates flowcharts as fast as you can type the words that go in the boxes. allCLEAR is the only flowcharter that automatically creates a chart from a simple text outline. Or, you can drag and drop shapes and branches to easily build charts. Whichever way you work, no other tool makes creating your diagrams this fast.

All the chart types you need

- allCLEAR is the fastest and easiest way to create:
- flow charts
 - fishbone diagrams
 - organization charts
 - deployment charts
 - procedure diagrams
 - network diagrams
 - process maps
 - and more

Reroute, redraw, resize instantly

allCLEAR makes revising flowcharts, especially complex ones, easy. When you make changes, allCLEAR instantly reroutes, redraws and resizes your diagram for you, saving you hours of work. And, allCLEAR is loaded with options to help you make your diagrams look great: diagram templates, fonts, colors, shapes, special effects, line styles, page layouts and much more.



Logical page breaks and page connectors are just some of the ways allCLEAR makes revising complex charts easy.

Get the Smarter Flowcharter

Two out of three allCLEAR customers tried other products first, then switched to allCLEAR, the Smarter Flowcharter. Why? Because simple drawing tools can't handle all the details of real-world flowcharting the way allCLEAR does. For our free evaluation kit, including a free demo, visit us at <http://www.spes.com/software/allclear>. Or call 1 (800) 543-5833.

allCLEAR
The Smarter Flowcharter™





A Handful Of Reasons To Buy The New Backpack® Bantam™ CD-ROM Drive.

Register to win FREE backpack products at Fall COMDEX - Booth#S3573



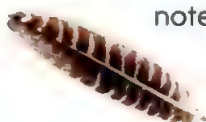
Multi-media capabilities. CD-ROM and Windows™ sound in one package (also available without sound).

It's the smallest, the fastest, and the best-looking, lightweight parallel port CD-ROM drive available—and it fits in the palm of your hand. It's the new backpack bantam CD-ROM drive with integral Windows™ stereo sound. You'll tote it any-



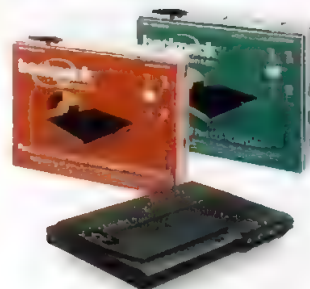
One cable connection puts portability in your hands. Cool!

where. Everywhere. Installation is a breeze. Simply plug this handy little drive into the printer port of any IBM-compatible pc or notebook. Use it with Windows (95, 3.X, NT*), DOS*, and OS/2*. What about your printer? The bantam has smart printer pass-through. It's a lot to put in one sleek package, but we did it.



A travel light CD-ROM solution

Free
CASE LOGIC® carrying case with purchase.
A \$32* suggested retail value.
(Limited Time Offer)



backpack®
bantam™

MicroSolutions
The portability leader.

Ph: 800-293-1214 (US and Canada)
or 815-756-3411, Fax: 815-756-2928
Internet: www.micro-solutions.com



FamilyPCRating

★★★★



*Sound not supported under DOS, NT, or OS/2

CDW - 800 736 4239 • Global Computer Supplies - 800 845 6225 • Inmac - 800 547 5444 • Micro Warehouse - 800 367 7080 • Midwest Micro - 800 413 9856
PC Connection, Inc. - 800 800 5555 • PCs Complete, Inc. - 800 514 4727 • PC Zone - 800 258 2088 • Quill - 800 789 0605 • USA Flex - 800 872 3539

CIRCLE 027 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

100% PURE JAVA

"Write Once, Run Anywhere"™ A program written in 100% Pure Java™ ensures portability across all Java™ compatible platforms or devices. All the companies on this page have been certified as 100% Pure Java or are going through the testing process at KeyLabs, an independent testing center (www.keylabs.com/100percent). 100% Pure Java. Pure and simple.

Business Communications

NetFactory, Inc.

NetCharts: HTML-configurable,
Java-based business-charting package
P: 301-625-5600
F: 301-625-5678
<http://www.netcharts.com>

Recital Corp

KALEIDOSCOPE: Internet/Intranet
realtime client/server development suite
VISIT OUR WEB SITE NOW!
www.recital.com

Chat Solutions

Paralogic Corporation

ParaChat: World's most
popular Java Chat
P: 510-795-0559 F: 510-795-6181
<http://www.paralogic.com>

Development Tools

ProtoView Development

JavaBeans Components
P: 800-231-8588
F: 609-655-5353
www.protoview.com/java

Electronic Publishing

Concurrent CAE Solutions

Test Drive EDA Browser™
Electronic Design Automation
P: 408-988-8170 F: 408-988-8171
<http://www.ccaes.com>

Internet Commerce

bidnask.com

Realtime Product Trading
contact.sales@bidnask.com
F: 941-732-5414
<http://www.bidnask.com>

Java Testing

KeyLabs Inc.

Official 100% Pure
Testing & Services
P: 888-keylabs F: 801-377-5439
www.keylabs.com

Productivity/Groupware

WebMan Technologies, Inc.

Timecruiser-Web event mgmt
P: 888-202-3521
F: 201-244-7859
www.timecruiser.com

Sys. Administration S/W

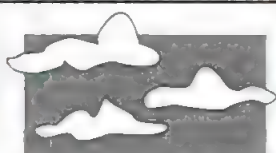
InterSoft Argentina S.A.

Process Control/Automation
P: +54-1-318-8900
F: +54-1-318-8999
www.inter-soft.com

Workflow

A-Frame Software Company

Intra/Internet workflow
Across multiple companies
Fully internationalized
A-Frame.com P: 800-237-2633



Cloudscape delivers
JBMS, the leading
Java-SQL database for
advanced distributed
applications.

Cloudscape, Inc.
180 Grand Ave.
Suite 300
Oakland, CA 94612

ph: 510.873.0900
fax: 510.873.0909

From Digital Camera to Web Animation One Tool, One Seamless Process

The first inexpensive paint program that lets you capture,
edit, assemble animated GIF images
and generate animated Java
applets using one seamless
creation process.

*Vivi
Painter*

WiGiTek Corporation

<http://www.wigitek.com> Toll free: (888)549-3719

For a Limited
time
\$19.95
SRP \$29.95

ISC

ISC Consultants, Inc.

your intranet solutions company

**Your website looks great!
Now make it useful.**

business@isc.com
212 477-8800
www.isc.com



Software Developers:

**Protect your Java Apps
from piracy with LicenseServ®**



- Create time limited demo copies.
- Stand-alone or networked environments.
- Licensing models include concurrent, usage-based, feature licensing, and more.
- 100% Pure Java Certified.

**Call now for a free evaluation copy
1-888-553-0334**



<http://www.wyattriver.com>

e-mail: info@wyattriver.com

(408)327-8840

LicenseServ Wyatt River Software and the Wyatt River Software logo are trademarks or registered trademarks of Wyatt River Software, Inc.

PC MARKETPLACE

I N D E X

MORE INFORMATION AND LINKS JUST ONE URL AWAY — WHEN YOU NEED MORE INFORMATION TO MAKE YOUR buying decisions than these ads provide, go to **Marketplace**. Search a database of hundreds of ads by company, product and/or key words. Vendors can update their prices and product offerings daily. Plus, link to the web sites of advertisers for even more information. (Look for @www. under the ads in this section.) Bookmark www.marketplace.zdnet.com for more ads, more information and links to advertiser web sites.

HARDWARE

	PRICED CLASSIFIED
Batteries.....	338
Boards/Components/Chips.....	325...339
Communications.....	326
Computer Systems.....	327...340
Input/Data Acquisition/Barcode/POS.....	330...340
Mass Storage Devices.....	331,333
Multi-Media.....	331,334
Networking.....	332
Peripherals.....	343
Power Supplies.....	343
Security.....	344

SOFTWARE

Barcode.....	344
Business Applications.....	333...344
Business Utilities.....	333
CD-ROM Titles.....	344
Communications.....	345
Education.....	335...345
Entertainment/Games.....	
Financial/Accounting.....	336
Internet Tools/Utilities.....	
Multi-Media.....	336

Religion.....	
Scientific/Engineering.....	
Security.....	344,345
Shareware/Public Domain.....	336
Adult.....	349

SERVICES

	PRICED CLASSIFIED
Data Conversion/Data Recovery.....	345
On-Line.....	337...347
Software Duplication.....	347

MISCELLANEOUS

	PRICED CLASSIFIED
Supplies.....	347
Accessories.....	336
Business opportunities.....	348

MARKETPLACE SALES — 800-825-4237

Andrew Sachs • Patricia Snow • Janet Pa • Lisa Whitley • Jackie O'Hare • Rachel Levy • Bill Heston
Midwest x4678 • Northeast x3626 • Southwest x5112 • Northern CA x5118 • Southeast x5136 • Northwest x3626 • Sales Manager x5965

Shop Online... Go to <http://www.computerlane.com>

Notebooks

Compaq Armada	
1510 P/133	\$1695
1520 P/133	\$1980
7750 P/133	\$4995
IBM Thinkpad	
380 P/133	\$1995
380D P/133	\$2250
560 P/133	\$2175
760 P/133	\$3890

Toshiba	
T200CS P/133	\$1795
T730XCD P/150	\$4480
740CDT P/166	\$5360
Liberto P50CT	\$deal

Peripheral

USR 56K Modem	
PCMCIA	\$199
Xircom Ethernet	
PCMCIA	\$159
HP Recordable	
CD-ROM	\$599
lomega Jaz Ext	\$285
Memory Laptop	WOW
16/32MB	\$89/165
Server Dim Memory	WOW
16/32/64MB	\$145/360/475
Matrox Mill II 4MB	\$220

Authorized
Dealer &
Service
Center

TOSHIBA

**HEWLETT
PACKARD**

Novell

IBM

Microsoft

COMPAQ

Intel

We carry Parts
In Stock for

COMPAQ

IBM • HP

TOSHIBA

For Warranty or
Non-Warranty

Desktops

Compaq	
2000 from	\$895
4000 from	\$1195
6000 from	\$1495
IBM PC 300	
300GL	\$1099
300XL	\$2460

Toshiba Equip	
5/166D	\$1645
5200D	\$1850

Hewlett Packard	
Vectra 520	\$995
Vectra 525	\$1395
Vectra XU from	\$2195

Server

Prosignia 200 6/166	
mdll	\$1599
Proliant 800 6/200	
m4300	\$2475
Proliant 2500 6/200	
mdll	\$deal
Proliant 5000	\$call
Proliant 6000	\$call
Netserver E40 6/200	
mdl	\$2275
Netserver LX 6/200 \$deal	
Netserver LH+ 6/200 \$deal	
PC Server 310	\$call
PC Server 330	\$call
PC Server 704	\$call



ENCORE ELECTRONICS INC.

THE SOURCE FOR YOUR

Novell Approved...

LAN PRODUCTS

- Complete Lan Cards
- Complete Hub Series

Full Duplex with Voice...

FAX/MODEM

- From 33.6K to 56.6K
- Speaker Function

Hot Plug & Plug...

SOUND CARDS

- Opti & Yamaha
- 3D Sound Card

WorldWide Web:
www.encore-usa.com

1-888-816-8668

CIRCLE 752 ON READER SERVICE CARD

50+ motherboards

Over 400 motherboard+CPU kits

award-winning systems, peripherals

hundreds of detailed specifications, pictures

24 hours a day, 7 days a week one web site

www.aberdeeninc.com/mag

888-453-0707

ABERDEEN

mag71021

Since 1983

800-526-3482

COMPUTERLANE INC.

Local/Int'l: 818-864-8644 Fax: 818-864-8253

7500 Topanga Canyon Blvd
Canoga Park CA 91303

email: eeolm01@sprynet.com or
comlane@instanet.com

ORCIRCLE 751 ON READER SERVICE CARD

ORCIRCLE 551 ON READER SERVICE CARD

Talk for Free Over The Internet

Internet Phone Sound Card

A
&
Q

TMI GOLDMASTER I-PHONE SOUND CARD

Pass The I-PHONE Acid Test

Why do you need the I-Phone Sound Card?

Because you can get almost free long distance calls & conference calls.

Why is your voice unclear from your Internet-Phone?

Because your sound card S/N ratio is very poor.

Why can't you do real time in and out from your Internet-Phone?

Because your sound card is not True Hardware Full Duplex.

Why do you hear noise and distorted voice from your Internet-Phone?

Because your sound card microphone-In is not specially designed and the single chip IC is of poor quality.

TMI Goldmaster I-Phone Sound Card Features:

- High quality TOPTEK TMI 8828 audio single chip w/echo effect.
- True Hardware Full-Duplex special designed for Internet-Phone & Video Conferencing real time & out talking w/zero lost or cut-off.
- S/N ratio around 85db for clear & natural voice w/zero distortion or noise.
- Unique microphone-in noise filter w/O/P amplifier design.
- Fully compatible w/SB, SBPRO, WSS & Win 95 plug & play

The best audio board solution for Internet Phone comes from TMI Gold Master I-Phone sound card.

New Products

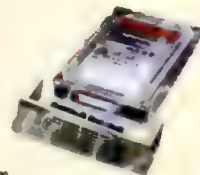
Video-Conferencing Kit

Bundle Vocaltec

I-Phone 4.5 w/video—full functions

HDD Cooler

- Extend hard drive life and reliability
- Dual high-efficiency ultra quiet fans
- Easy access air filter
- 3.5" hardware mounting kit included
- Y adapter for any hard drive



GM-16EX (TMI-8828 chip)
16-bit Sound Card



GM-32LX (TMI 8828 chip)
Built-in Wavetable 3D Sound Card



Vocaltec I-Phone 4.5 Full Version
(Market Value USD \$49.95)



YAM-16 BS (YAHAMA 7185 chip)
16-bit PnP Sound Card



YAM-32LX (YAHAMA 7195 chip)
Wavetable 3D Sound Card



TMI Family Products

I-PHONE KIT Includes: ★ I-phone sound card ★ Wavetable upgrade ★ Vocaltec Internet Phone 4.5 Full Ver. — Total ~~\$109.95~~ **NOW ??**

OEM & ODM Welcome TMI
TMI
A Member of the Tiptek Group

Manufacturer & Exporter:
TMI MULTIMEDIA INC.
14140 Live Oak Ave., Unit C
Baldwin Park, CA 91706

Tel: (626) 960-9211 • Fax: (626) 960-0703

E-mail: toptekusa@aol.com

<http://www.toptek-tmi.com>

All brand names and trademarks are the property of their respective owners.

©www. OR CIRCLE 774 ON READER SERVICE CARD

PREMIER
Marketplace
©1997 TMI

PREMIUM MarketPlace Shop www.marketplace.com. Hundreds of ads, plus links to the Web sites of our advertisers.

All-In-One VGA Card



KOUWELL

**KeyVision 128-bit
All-In-One VGA**

128-bit ET8000
Graphic Accelerator

Max 1600x1200 resolution
Selected live video from
Air-TV, Cable-TV, VCR, LD, V8
or camcorder function

Composite and S-video input,
audio output capable

Support NTSC or PAL video format
30 FPS video and audio capture

Call us
for more
products
or info!

(562) 699-5340
Koutech Systems, Inc.
www.koutech.com
koutech.info@worldnet.att.net
 9314 Norwalk Blvd. Suite 20 Springs, CA 90670

CIRCLE 755 ON READER SERVICE CARD



Xtreme system

POWERMASTER EITE

Intel Pentium II processor with MMX™ technology

300
SIMPLE ON DUAL PROCESSOR



SIREX
Superior Quality Superior
888-747-7902

CIRCLE 757 ON READER SERVICE CARD

Micro Firmware BIOS Upgrades

EIDE Disk Controllers



MICRO FIRMWARE

THE ONLY AUTHORIZED
PHOENIX DEVELOPER
AND DISTRIBUTOR
SINCE 1987

Features:

- Large hard drive support - 4 drives up to 8 gigs each
- Plug & Play support for Windows 95
- Support for the newest operating systems and CPUs
- Multi-level password security built in
- None of the disadvantages of overlay software
- Best technical support before and after the sale
- Free lifetime maintenance updates

MAJOR CREDIT CARDS, C.O.D. & PREPAY ORDERS ARE ACCEPTED
 UNIVERSITY, INSTITUTIONAL & CORPORATE PURCHASE ORDERS WELCOME

1-405-321-8333

Email orders: sales@firmware.com
 World Wide Web: <http://www.firmware.com> **1-800-767-5465**

CIRCLE 756 ON READER SERVICE CARD

BIOS Upgrades

Why replace your computer?
Simply replace 1 chip.

Gain instant compatibility with
all the latest hardware and software.

MOTHERBOARDS/SYSTEMS THAT WE SUPPORT: ASUS - BIOSTAR - INTEL - FUJII
 SUPERMICRO - TIAN - AMPTON - ACER - PC - GIGABYTE - J-BOND - MICRONICS - OCTEK
 SHUTTLE - SOYO - TEC - EDOM - M-TECH - ECS - TMC - MICROSTAR - DTK - GCT - DELL
 PACKARD BELL - GATEWAY 2000 - IBM - AST - COMPAQ - and many more

UNICORE CALL TODAY: 800-800-BIOS 24/7
 FAX: 979-682-1030 TEL: 979-682-0488 <http://www.unicore.com>

Volume discounts available. We will beat any competitor's price!
 University, institutional and corporate purchase orders welcome

We stock the largest variety of ROM BIOS upgrades, including:





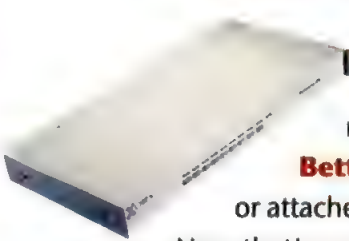

Refunds may be subject to resending fees.

CIRCLE 758 ON READER SERVICE CARD

lets you do **more,**

do it **better,**

do it for **less!**



Announcing the **AutoView Commander**;
 the keyboard/video/mouse switch with all the right stuff!
More ways to select attached servers with convenient on-screen
 menus, traditional Cybex push-buttons or a quick keyboard sequence.
Better design for easy reconfiguration without powering down the switch
 or attached servers. And best of all ... it costs **less** than many comparable switches.

Now that's good stuff.
 One Company. One Solution. Cybex.



Cybex Computer Products Corporation
 4912 Research Drive Huntsville, Alabama 35805 USA
 (800) 93CYBEX (29239) • (205) 430-4030 fax
<http://www.cybex.com>

AutoView is a trademark of Cybex Computer Products Corporation. Cybex is a registered trademark of Cybex Computer Products Corporation. Banyan is a trademark of Banyan Systems Inc. Network is a registered trademark of Novell Inc. Lantastic is a registered trademark of Artisoft Inc.

See us at Network & Interop, Oct 8-9, Booth#3945E






www. OR CIRCLE 759 ON READER SERVICE CARD

Breakthrough

In Keyboard Monitor Switches

Multi Platform & On-Screen Display

BREAKTHROUGH the clutter of multiple keyboards, monitors, and mice with this latest **INNOVATION** from Rose. This switch has every feature you asked for:

- Switches several servers or computers to a single monitor, keyboard, and mouse
- Supports any mix of PC, Apple, Sun, RS 6000, HP 700 series, DEC Alpha, SGI, or other computers from any keyboard or mouse
- Front panel has keypad for easy selection of computers and configuration
- Front panel display shows computers name and other information
- Command to switch can come from keyboard, front panel, or RS232 port
- Simple to use keystrokes switch computers for fast and easy control

Built in daisy-chaining supports up to 256 computers

Flash memory for future upgrade of features

Easy to use **OverView™** system gives command and status with on-screen graphics

Many other features!

CALL FOR A FREE CATALOG:

- Keyboard/Video Control
- Print Servers
- Data Switches

800-333-9343

SEE US AT
NETWORK-INTEROP
October 8-10, Atlanta, GA
Booth #7822

VISIT OUR WEB SITE AT WWW.ROSEL.COM

ROSE ELECTRONICS

10707 STANCLIFF ROAD HOUSTON, TEXAS 77099 TEL: 281-933-7673 FAX 281-933-0044

www. OR CIRCLE 760 ON READER SERVICE CARD

Are you getting it? Optimum Performance

Keyboard/Video & Mouse Switches

KVS does much more than just switch peripherals. But, with all the products on the market today, which system will be the best solution for your company? Give yourself complete control over your data center and how it's personnel operate.

THE SMART CHOICE IS TRON.

Let experienced technicians take you through the Keyboard/Video Switch maze of vendors and products. After all, we introduced the technology to you in our Industry Standard *Keyboard/Video Switch (KVS) White Paper*. Tron uses and test KVS products in our own offices and lab,

Where each vendor promotes their own product, Tron can give you a complete comparison of several products all at once.

Call! for your copy of the **White Paper**

TRON INTERNATIONAL, INC.
(800) 808-4672

Or, download the Keyboard/Video Switch (KVS) White Paper from our internet site www.tron.com

CIRCLE 762 ON READER SERVICE CARD

Siliconrax

Hot Swap Redundant PS ATX/ 8/14 or 20 Pin slots

SR-6020
Pentium Pro PC/ISA SBC

SR-465 ATX
15 Rackmount Chassis

Completely Configured Systems
Rackmount System Enclosures
NETAT 4/12 Industrial Workstations
Monitor • Keyboard Enclosures
Single Board Computers
3 to 20 Slot Passive Backplane
(Up to 8 PCI slots)

More Information
800-700-8560
<http://www.siliconrax.com>
E-mail: info@siliconrax.com
Leasing option available
Tel: 408-720-1090 Fax 408-245-2570
All major credit cards accepted.

CIRCLE 763 ON READER SERVICE CARD

Intermart Systems

Digital Camera PC Card Reader/Writers

- Win95, Win 3.x, DOS, Mac and Unix compatible
- PC Card Standard Type 1, 2 & 3
- Read/write on any SCSI system
- SRAM, flash disk, ATA flash, hard disks and compact flash

PCD-10

Phone: 1-800-451-1571 or (408) 379-0770 or Fax: (408) 379-3666
131-D Albright Way Los Gatos, CA 95032

VISA MasterCard

PCD-10 1-slot external reader/writer.....\$349.00
PCD-15 2-slot external reader/writer.....\$399.00
PCD-15 2-slot internal reader/writer.....\$299.00
<http://www.intermartsys.com>

www. OR CIRCLE 764 ON READER SERVICE CARD

AVI Is Your Projection Connection!

30 DAY MONEY BACK GUARANTEE
100% COMPLETE SATISFACTION GUARANTEED

NEW! **EPSON POWERLITE 7000**
Call for Best Price
First portable true VGA
1024 x 768 resolution
Available complete
1024 x 1024 • PowerLite
bright 4700 lumens • External
projector • 40" • Super long
For True SVGA (800 x 600)
order the ELP-5000!

CTX EzPro 550
Call for Best Price
SVGA 1024 x 768
Also available in VGA
Super long life 9000
hours operating life
with 3 year

Projectors For As Little As \$2799

We'll Help You:

- With the largest selection of leading brands.
- With FREE loaner units overnight.

With technical support.

With our 20 years of experience.

Ask For Your FREE Guide: The ABCs of LCDs.

Call Toll-Free 800-475-1986

Audio Visual Innovations
Your Source For Being Seen And Heard
Mon-Fri 8AM-8PM EST
For More Info Visit <http://www.avinc.com>

We Sell, Rent or Lease All Major Brands!

www. OR CIRCLE 766 ON READER SERVICE CARD



42ND ST PHOTO

378-5th Avenue, Between 35th & 36th St.
New York, New York 10018

CORPORATE ACCOUNTS WELCOME

www.42photo.com

Local #: (212) 643-8855 Fax #: (212) 643-0608



888-870-4242

Store Hours: Mon-Friday 9:00am-8:00pm
Sunday 10:00am-7:00pm



IBM Notebooks

TP365X, P133, 8/1.06G, 11.3" DS	Special
TP365XD, P133, 8/1.35G, 11.3" DS, 6X CD	1179
TP380D, P150 MMX, 16/2.1G, 12.1" TFT SVGA, 6X CD	Special
TP380D, P150, 16/1.3G, 12.1" DS SVGA, 6X CD	Special
TP380, P150, 16/1.06G, 12.1" DS SVGA, 6X CD	1169
TP560, P100, 8/810, 11.3" DS	1129
TP560, P133, 8/1.06G, 12.1" TFT	Special
TP560, P133, 8/2.1G, 12.1" TFT	Call
TP560, P133, 8/2.1G, 11.3" DS	2299
TP560E, P150 MMX, 16/2.1G, 11.3" DS	2399
TP560E, P166 MMX, 32/2.1G, 12.1" TFT	Special
TP760E, P150, 16/2.1G, 12.1" TFT	Call
TP760E, P133, 16/2.1G, 12.1" TFT, 6X CD	Call
TP760EL, P120, 8/1.06G, 12.1" TFT	Special
TP760EL, P133, 16/1.06G, 12.1" TFT	Call
TP760EL, P133, 32/2.1G, 12.1" TFT	Call
TP760XD, P166 MMX, 32/2.0G, 12.1" TFT, 6X CD	Call
TP760XL, P166 MMX, 16/2.1G, 12.1" TFT	3699
TP760XL, P166 MMX, 32/2.1G, 12.1" TFT	Call
TP765D, P166 MMX, 32/3.0G, 13.3" TFT, 6X CD, 28.8K	Special
TP765L, P166 MMX, 32/3.0G, 13.3" TFT, 28.8K	Special

TEXAS INSTRUMENTS Notebooks

EXTENSA 610CD, P150, 16/1.4G, 11.3" DS, 10X CD	Special
EXTENSA 610CDT, P150, 16/1.4G, 11.3" DS, 10X CD	Special
EXTENSA 655CD, P133, 16/1.35G, 12.1" DS, 10X CD	1189
EXTENSA 650CDT, P133, 16/2.1G	2099
EXTENSA 660CD, P166 MMX, 16/1.35G	Call
EXTENSA 660CDT, P166 MMX, 16/2.1G, 12.1" TFT, 10X CD	2599
EXTENSA 900, P133, 16/1.35G, 12.1" DS	2299
EXTENSA 900CDT, P133, 16/1.35G, 11.3" TFT	Call
EXTENSA 900T, P133, 16/1.35G, 11.3" TFT	Call
DOCKING STATION, Multi CD Rom w/ 2 extra battery bays	399
TM6020, P120, 8/810, 11.3" SVGA, 28.8K	Mod Special
TM6030, P133, 16/1.35G, 12.1" SVGA TFT, 28.8K	Special
TM6050, P150, 16/1.35G, 12.1" TFT, 28.8K	Mod Special
TM6050NT, P150, 32/2.1G, 12.1" SVGA, 10X CD	3799
TM6160, P166 MMX, 32/2.1G, 12.1" TFT, 10X CD	Call
TM7060, P166 MMX, 32/2G, 12.1" TFT, 10X CD, 33.6K	4399
TM7063N, P166 MMX, 32/3G, 12.1" TFT, 10X CD, 33.6K	5099

NEC Versa Notebooks

VERSA 2530, P133, 16/1.44G, 12.1" DS	1109
VERSA 2630 CD, P133, 16/1.44G, 12.1" 10X CD	Call
VERSA 2650CD, P150 MMX, 16/1.4G, 12.1" 10X CD	Call
VERSA 2650CDT, P150 MMX, 16/1.4G, 12.1" TFT, 10X CD	2999
VERSA 4080H, P120 MHz, 8/1G, 10.4" Hi-Res TFT	Call
VERSA 6030H, P133, 16/1.35G, SVGA TFT, 6X CD	Call
VERSA 6030X, P133, 16/1.44G, XGA TFT, 6X CD	Special
VERSA 6050MH, P150 MMX, 16/1.4G, 12.1" TFT, 10X CD	Call
VERSA 6050MX, P150 MMX, 16/2.1G, 12.1" TFT, 10X CD	Call
VERSA 6050NT, P150 MMX, 16/2.1G, 12.1" TFT, 10X CD	Call
VERSA 6250MX, P166 MMX, 32/2.1G, 13.3" TFT, 10X CD	4999

Canon Notebooks

Innova 475CDT, P100, 8/810MB, 11.3 TFT, 4x CD	1399
Innova 490CDS, P133, 16/1.06G	1699
Innova 490CDT, P133, 16/1.06G	Special

TOSHIBA Notebooks

T110CS, P100, 8 EDO/810MB, 11.3DSTN	959
T205CDS, P100, 8/810, 11.3" DSTN, 6X CD	Special
T220CDS, P133, 16/1.44G, 12.1" DSTN, 10X CD	Special
T425CDS, P100, 8 EDO/810, DSTN, 6X CD	1199
T430CDS, P120, DSTN, 16/1.35 G, 11.3", 10X CD	Special
T430CDT, P120, 16/1.35 G, TFT, 10X CD	1799
T440CDT, P133, 16/1.35 G, 12.1" TFT, 10X CD, 36.6K	Special
T440CDX, P133, 16/1.34 G, 12.1" TFT, 10X CD	Special
T460CDX, P166 MMX, 32/2.0 G, 12.1" TFT, 10X CD, 33.6K	Special
T510CDT, P133, 16 EDO/2 G, 12.1" TFT, 10X CD	Special
T550CT, P133, 16/1.2 G, 11.3" TFT	1219
T650CDT, P133, 16/1.2 G, 11.3" TFT	Call
T730CDT, P150, 16/2G, 12.1" TFT, 6XCD	Call
TECRA T500CDT, P120, PCI 16/1.2G, TFT, 6XCD	Call
TECRA T500CS, P120, PCI 16 EDO/1.2 G	1599
TECRA T320CDT, P166 MMX, 32/2.1G, 12.1" TFT, 10X CD, 33.6K	Special
TECRA T320CDT, P166 MMX, 32/2.1G, 12.1" TFT, 10X CD, 33.6K	Special
TECRA T720CDT, P133, 16 EDO/1.2G, 12.1" TFT, 10X CD	Call
TECRA T730CDT, P150, 16 EDO/2G, TFT, 10X CD	Call
TECRA T740CDT, P166 MMX, 16 EDO/2G, TFT, 10X CD	4799
TECRA T740CDT, P166 MMX, 16 EDO/3G, TFT, 10X CD	Call
PORTEGE T660CDT, P150 MMX, 16 EDO/1.35G, TFT, 10X CD	Call
PORTEGE T300CT, P133 MMX, 32MB EDO/1.5G, 10.4" TFT, 33.6K	Call
LIBRETTO 50, P75, 16/760, 6.1 Active, 1.85 Lbs	Special

digital Notebooks

Hi-Note VP562, P133 MMX, 16/1.4G, 12.1" TFT, 12X CD	Special
Hi-Note VP567, P133 MMX, 16/1.4G, 12.1" TFT, 12X CD	Special
Hi-Note VP575, P166 MMX, 16/2.1G, 12.1" TFT, 12X CD	3759
Ultra II, P133, 16/1.35G, 11.3" TFT, Win95	4699
Ultra II, P150, 16/1.4G, 11.3" TFT, Win95	Call
Ultra 2000, P166 MMX, 32/2.1G, 12.1" TFT, 10X CD, 33.6K	Special
Ultra 2000, P166 MMX, 32/2.1G, 14.1" TFT, 20X CD, 33.6K	5899

AST Ascentia Notebooks

ASCENTIA A60+, P150, 16/1.4G, 12.1" TFT SVGA, 10X	2699
ASCENTIA A70+, P150, 16/1.4G, 12.1" TFT SVGA, 10X, 33.6K	Call
ASCENTIA P70, P150, 32/2.1G, 12.1" TFT, 10X, 28.8 Mod	Call
ASCENTIA P80, P166, 32MB 3.0GB HD, 12.1" TFT, 10X, 28.8 Mod	4699

Palmtop's Window CE

CASIOPEIA HANDHELD PC, 2 MB	399
CASIOPEIA HANDHELD PC, 4 MB	459
CASIOPEIA HANDHELD PC, 6 MB	559
COMPAQ PC COMPANION C120, 2MB	Special
COMPAQ PC COMPANION C120+, w/Modem	Special
COMPAQ PC COMPANION C140, 4MB	Special
HEWLETT PACKARD PALMTOP 300LX, 2MB	479
HEWLETT PACKARD PALMTOP 320LX, 4MB	589
NEC MOBILEPRO 200, 2MB	479
NEC MOBILEPRO 400, 4MB	599
US ROBOTICS PALM PILOT PERSONAL	279
US ROBOTICS PALM PILOT PROFESSIONAL	379
PHILIPS VELO	Special

COMPAQ Notebooks

ARMADA 1510DM, P120, 16/1.06G, 11.3" DS, 33.6K	Special
ARMADA 1520DM, P133, 16/1.06G, 11.3" DS, 33.6K	Special
ARMADA 1535DM, P133 MMX, 16/1.4G, 12.1" DS, 10X CD, 33.6K	2399
ARMADA 1550DMT, P133, 16/1.4G, 12.1" TFT, 10X CD, 33.6K	Special
ARMADA 1585DMT, P150 MMX, 16/2.1G, 12.1" TFT, 10X CD, 33.6K	3499
ARMADA 4120, P120, 16/1.06G, 11.3" DS	Call
ARMADA 4150, P150 MMX, 16/1.6G, 12.1" DS	Special
ARMADA 4160T, P166 MMX, 16/2G, 12.1" TFT	Special
ARMADA 7710MT, P150 MMX, 16/2.1G, 12.1" TFT, 33.6K	Special
ARMADA 7730MT, P166 MMX, 32/2.1G, 12.1" TFT	4699
ARMADA 7550MT, P166 MMX, 32/1.6 G, 12.1" TFT, 10X CD	5799
PRESARIO 1210, P150MMX, 16/1.4G, 12.1" DS, 33.6K, 10X CD	Special
PRESARIO 1610, P150MMX, 16/1.6G, 12.1" DS, 33.6K, 10X CD	2499
PRESARIO 1620, P166MMX, 16/2.1G, 12.1" DSTN, 50 X 20X CD	Special
PRESARIO 1080, P166MMX, 16/1.4G, 12.1" TFT, 33.6K, 10X CD	Special
LTE 5300, P133, 16/1.3G, 12.1" TFT	Special
LTE 5380, P133, 16/2.1G, 12.1" TFT	2999
LTE 5400, P150, 32/2.1G, 12.1" TFT	Call

Samsung Notebooks

SENS 810 P150, 16/2.1G, 12.1" TFT, 6XCD	2299
SENS 810 P133, 16/2.1G, 12.1" TFT, 6XCD, 28.8K	Special
SENS PRO 520 P150, 48/2.1G, 12.1" TFT, 10XCD, NT	Special
SENS PRO 520 P133, 16/1.4G, 12.1" TFT, 10XCD, NT	Special
SENS PRO 520 P133, 32/2.1G, 12.1" TFT, 10XCD, NT	Special
SENS PRO 500 P120, 16/1.4G, 12.1" TFT	Special
SENS PRO 500 P150, 16/2.1G, 12.1" TFT, 6XCD, 33.6K	2399

HITACHI Notebooks

C-SERIES, P133, 8/1G, 12.1" TFT, 28.8 Modem	1999
E-SERIES, P133, 16/1G, 11.3" DS, 28.8 Modem	Special
E-SERIES, P133, 16/1G, 11.3" TFT	1199
M-SERIES, P120, 16/1G, 11.8" TFT, 8X CD	1199
M-SERIES, P133, 16/1G, 11.8" TFT, 6X CD, 28.8 Mod	1799
MX-SERIES, P150, 16/2.1G, 12.1" TFT, 8X CD, 33.6K	2999
MX-SERIES, P133, 16/1.35G, 12.1" TFT, 8X CD, 33.6K	2199
VISIONBOOK ELITE, P168, 16/2.1G, 13.3" TFT, 10X CD	Special
VISIONBOOK PLUS, P133, 16/2.1G, 12.1" DS, 10X CD, 33.6K	1899
VISIONBOOK PLUS, P150 MMX, 16/1.4G, 12.1" DS, 10X CD, 33.6K	Call
VISIONBOOK PLUS, P166 MMX, 16/2.1G, 12.1" DS, 10X CD, 33.6K	Call
VISIONBOOK PRO, P133, 16/1.4G, 12.1" DS, 10X CD	Call
VISIONBOOK PRO, P166 MMX, 32/2.1G, 12.1" DS, 10X CD	4699
VISIONBOOK PRO, P166 MMX, 32/3G, 13.3" TFT, 10X CD	4999

HEWLETT PACKARD Notebooks

OMNIBOOK 2000CS, P133, 16/1.4 G, 12.1" DS	2199
OMNIBOOK 2000CT, P133, 16/1.4 G, 12.1" TFT	2499
OMNIBOOK 2000CT, P133 MMX, 16/2.1 G, 12.1" TFT	Special
OMNIBOOK 5500CS, P100, 16/810	1359
OMNIBOOK 5500CT, P120, 16/1.3 G, 11.3" DS	Special
OMNIBOOK 5500CT, P133, 16/2G, 12.1" TFT	Call
OMNIBOOK 5500CTS, P133, 16/1.35G, 12.1" TFT	Call
OMNIBOOK 5700T, P150 MMX, 16/2 G, 12.1" DS	Call
OMNIBOOK 5700CT, P166 MMX, 16/2 G, 12.1" TFT	4259
OMNIBOOK 8000CT, P133, 16/1440, 10" TFT	Call
OMNIBOOK 800CT, P166 MMX, 16/2.1 G, 10.4" TFT	4299

Fujitsu Notebooks

LIFEBOOK 4200, P120, 16/1G, 11.3" DS, 10X CD	Special
LIFEBOOK 4350X, P133 MMX, 16/1.3, 12.1" DS, 10X CD	Special
LIFEBOOK 5200, P120, 8/810, 11.3" DS, 6X CD	1199
LIFEBOOK 520T, P133, 16/1.3G, 11.3" TFT, 6X CD, 28.8K	1599
LIFEBOOK 531T, P133, 16/1.3G, 11.3" TFT, 10X CD, 36.6K	1899
LIFEBOOK 535T, P133, 16/2.0G, 12.1" TFT, 10X CD, 36.6K	Special
LIFEBOOK 555TX, P150 MMX, 16/2.0G, 12.1" TFT, 10X CD, 36.6K	3199
LIFEBOOK 555T, P150, 16/1.3G, 12.1" TFT, 6X CD, 28.8K	Special
LIFEBOOK 555T, P150, 16/1.3G, 12.1" TFT, 6X CD, 28.8K	Special
LIFEBOOK 565TX, P166 MMX, 32/2.0G, 12.1" TFT, 20X CD, 36.6K	3999
LIFEBOOK 635T, P133, 16/1.3G, 12.1" TFT, 6X CD, 28.8K	Special
LIFEBOOK 655TX, P150 MMX, 16/1.3G, 12.1" TFT, 33.6K	2895
LIFEBOOK 655TX, P150 MMX, 16/2.0, 12.1" TFT, 10X CD, 33.6K	3999

PCMCIA CARDS

XJACK 28.8 Cellular Modem	99
PCMCIA Lan 10 Base I	69
PCMCIA Lan 10 Base II	69
MEG Card Zoom Video	199

LINEAR FLASH MEMORY CARD

ALSO FOR MEMORY	8 MB	1179	16 MB	329	
2 MB	99	10 MB	229	20 MB	Call
4MB	109	12 MB	299	24 MB	Call

PCMCIA ATA FLASH MEMORY

ALSO FOR MEMORY CARDS	16 MB	329	40 MB	499	
4 MB	99	20 MB	399	48 MB	599
8 MB	159	24 MB	409	56 MB	799
12 MB	299	32 MB	429	64 MB	999

Digital Cameras

Kodak
DC-20, DC-25, DC-40, DC-100 \$189.99 and up
NEW D-3000, 1204X760 Resolution, 1/3" STOCK
3X Power Zoom with Macro CALL

Nikon
100 8.2MM, 512X480 Pixel
300 640X480 wideangle pan SPECIAL

RICOH
RDCE Wide angle Tele, PCMCIA Slot \$149.99
RDCE40 400 640X480 Res Color Monitor Special

SONY
MAGICA w/3.5 floppy storage
DSC-F1 4 MB 640X480 Hi-Tech Mac & PC 199
DCC-D1 CALL

CASIO
QV 10A Plus 179.99 QV-11 229.99
QV-100QV 120V QV-300 IN STOCK

SHARP
SHAPPY 2.0 VIDEO SHAPENOT \$189.99 After Rebate

Due to industry price changes, call for current pricing and availability. PRICES AND AVAILABILITY ARE SUBJECT TO CHANGE. 15 day return and exchange. All items returned must be in original packaging and documentation. A minimum 5% restocking fee may apply. Shipping and handling are non-refundable. No returns without RMA number. All printers are not returnable unless defective. All software are not returnable unless manufactured sealed. All items carry a Full Manufacturer's Warranty except of refurbished items. All logos and trademarks are registered trademarks of their respective holders. Prices are valid for Manhattan only. Not responsible for typographical errors. Pictures used for illustration purposes only. We reserve the right to limit quantities. All prices and details in this ad are valid to the end of this month publication date. Prices valid for Manhattan only.

Intel Pentium® Processor Based PC's "At The Right Price"

Intel Pentium® II processor and Pentium® processor based PC's by MEDIAON™

Every System Features An Intel Motherboard

- 2 year parts and labor warranty
- Name brand components
- Fully assembled, tested and burned-in

Options

- Installation of add-on peripherals
- Memory upgrades
- Hard drive upgrades

Brand names

Add-ons from Mitsumi, TEAC, Western Digital, Quantum, Fujitsu, Maxtor, Diamond, Trident, Creative Labs, U.S. Robotics, Proton, JTS and other major brands.

Systems by MEDIAON™

Expert II

Intel Pentium® II Processor based systems

- Intel Pentium® II Processor
- Intel PD440FX ATX Motherboard with USB-Pentium II
- 32MB EDO Memory
- ATX Mid Tower chassis
- UL/CSA approved 235 Watt power supply
- 24X IDE CD-ROM Drive
- 3GB IDE HD/Teac 1.44 Floppy Disk Drive
- Mitsumi 104 key PS/2 keyboard
- Microsoft PS/2 Mouse
- Microsoft Windows 95 CD-Rom
- Diamond Stealth 3D 2MB VRAM Video
- Yamaha OPL sound system/80 Watt speakers

233 Pentium® II Processor.....	\$1,759.00
266 Pentium® II Processor.....	\$1,895.00

Expert II

Intel Pentium® processor based system with MMX™ technology

- Intel Pentium® Processor 166,200,233 MHz with MMX™ technology
- Intel AN430TX ATX motherboard w/built-in Sound, 512K Pipeline Burst Mode Cache, and USB
- ATX Mid-tower chassis with 235 Watt UL approved P/S
- 16MB SDRAM DIMM memory
- 16x CD-Rom Drive/80 Watt Speakers
- 2GB IDE HD/Teac 1.44 Floppy Disk Drive
- Mitsumi 104 keyboard/MS' PS/2 Mouse
- S3 3D 4MB Video
- Microsoft Windows 95 CD-Rom

166 Pentium® Processor w/MMX™ technology.....	\$1,069.00
200 Pentium® Processor w/MMX™ technology.....	\$1,189.00
233 Pentium® Processor w/MMX™ technology.....	\$1,345.00

**Call us to
order today!**

We welcome government, educational
and corporate purchase orders!

1-800-552-7835

FAX: 510-490-5261

**Built in The Heart of
Silicon Valley!**



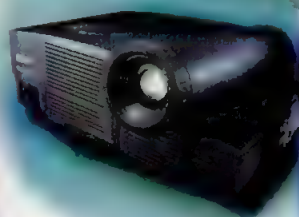
MEDIAON
The Computer Experts™

Check out our website at www.mediaon.com
for latest prices and configurations



"Monitor sold separately"

Prices and specifications subject to change without notice. MEDIAON™ and The Computer Experts are trademarks of MEDIAON™ Incorporated. The Intel Inside logo and Pentium are registered trademarks of Intel Corp. All other trademarks are properties of their respective owners.



Boxlight 2002

Equipped with easy-to-use features.

- 300 Lumens
- Built-in audio
- SVGA 800 x 600
- Weight 16lbs.

\$3,999

*Business Lease \$139/mo



Revolution 6000

Lightweight, high resolution.

- True 1024 x 768 XGA
- 500 ANSI lumens
- Compact 13 lbs.
- Mac, PC and Workstation compatible.

Call for price

*Business Lease available



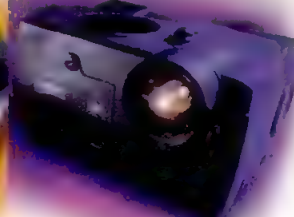
Revolution 3700

The new standard for portable multimedia performance.

- 450 ANSI, true SVGA
- Weight 12lbs.
- 3-LCD Polysilicon
- Zoom, Auto-Setup

Call for price

*Business Lease \$229/mo



Boxlight 4802

This lightweight compact DLP comes ready for travel.

- Hard-sided porter case
- 500 ANSI lumens
- A portable 18 lbs.

\$5,599

*Business Lease \$175/mo

**Technology makes it possible;
Boxlight makes it easy.**

Let us do the work for you.

When you're ready to rent or buy the latest presentation technology, look to Boxlight. We have searched all over the world for the finest hardware available and can supply you with the best equipment to meet your needs and budget. We "pre-shop" the entire industry to pick the highest value products from such trusted manufacturers as Infocus, Proxima, nView, Panasonic and Sanyo. And because we buy in volume, we can offer the best prices you'll find anywhere.

**ASK US
ABOUT
RENTALS**

It's as easy as 1,2,3.

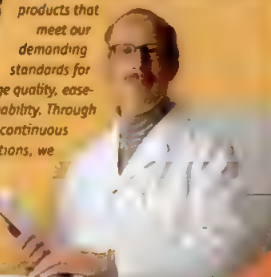
You begin by discussing your needs with our team of presentation experts. When you've agreed on the best solution, it will be delivered directly to your office as early as the next day. You connect it to your PC, and it is ready to run—projecting full-color images onto a big screen.

We support your purchase with our superior package of services, from extended warranties and upgrade programs to free technical support.

It's what we call—"Boxlight Certified." It's what you'll call—satisfaction!

Buy with confidence.

Every Boxlight product has a 30-day money-back guarantee—period. We can make that promise because we select products that meet our demanding standards for image quality, ease-of-use and reliability. Through field trials and continuous quality inspections, we ensure that you get the best products the industry has to offer.



CALL US NOW AND WE'LL START WORKING FOR YOU TODAY

1-800-216-3396

Government: 800-497-4009

Resellers: 800-736-6956

International: 360-779-7901

Rental: 800-736-6954

Fax: 360-779-3299

Education: 800-689-6676

BOXLIGHT™
CORPORATION

Monday - Friday, 6am - 5pm PST. Purchase orders accepted w/ O.A.C. Prices subject to change. Quantities may be limited to stock on hand. 30-day money-back guarantee does not apply to Resellers and special orders. *Business lease is 36 month F.W. lease requiring first and last month's payments at lease inception. Price does not include sales tax. Call for complete details.



<http://www.boxlight.com/pcmag/>

BOXLIGHT



**Take
now for
your FREE
trial order!**

CHI CORPORATION
East-800-828-0599
West-800-928-9099

Headquarters—Chi Corporation
 30275 Bainbridge Rd., Suite 2A
 Solon, OH 44139
 216-349-8605 Fax 216-349-8609

Phoenix Office—Chi Corporation
 10840 North 28th Dr., Bldg. C205 Suite 21
 Phoenix, AZ 85029
 602-548-9010 Fax 602-548-9041

Nine Track Tape Systems
 All Densities—800/1600/3200/6250
 All Platforms
3480/3490/3490E/3590
 compatible
 Single Load or 10 or 60
 cartridge Libraries

Data Conversion Services
 4mm, 8mm, 9trk, 3480, 3490,
 3490E, EVEN TO CD

CD ROM Recorders
 2x/6x, 4x/6x—All platforms
 Media Form CD duplication systems

CD ROM Jukeboxes
 NSM, SONY, JVC, Pioneer, Cygnel
 Libraries by ADIC

DLT—4mm—8mm
 Complete Network backup
 Solutions—Novell, NT, Unix
 Libraries by ADIC

Chi Corporation: Manufacturers of the
Award Winning OutRight and ReelView II Software

CD ROM Jukebox
 For Novell or NT Software by Smart Storage
CHI 1635
 35 Disk capacity with 7–16x CD ROM Readers
 Includes all necessary software, cables, SCSI card
 Also Available in other configurations
 1620–20 slot, 4–16x readers, 1625–25 slot, 5–16x readers
 1630–30 slot, 6–16x readers, 1635R–30 slot, 6–16x readers,
 One Yamaha 4x CD recorder, 6x reader

www.chi corporation.com
 CIRCLE 767 ON READER SERVICE CARD

3D PixelView 3D ComboTV

125 Channel TV Tuner
 FM Antenna
 TV Antenna
 Video-In
 Audio-In
 VGA-Out

DTV-Camera S-Video-In
 For FM Audio-Out
 BIOS
 Cirrus Logic CL-PX4072 Decoder Chip
 Feature Connector

Connector for MTS/Teletext
 64 Bit Cirrus Logic CL-GDS465 VGA Chip
 AMM KDRAM

INTERNET VIDEO CONFERENCING SOLUTION

PixelView Meeting PAK

Video Conferencing over Internet or point to point at any existing PC

- Resolution up to 1600 x 1200, 64K Colors (4MB)
- Support NTSC/PAL/SECAM Standard
- Various Functions
 - Watch TV or LD, VCR, CAM
 - Listen to FM Radio
 - MPEG Movie Playback
 - Play 3D Games or 3D Programs
 - Video Conferencing with Optional CAM

PROLINK
PROLINK COMPUTER INC. (USA)
 Tel: 626-369-3833 800-686-8100 Fax 626-369-4883
 email: sales@prolink-usa.com

Website: http://www.prolink-usa.com
 www. OR CIRCLE 770 ON READER SERVICE CARD

Custom ULTRA SCSI Tools

SCSIVue Active Terminator \$59
 • Improves SCSI Bus Performance
 • Less Errors, More Reliable Data Transfer
 • Diagnoses Problems • Analyzes Signal Quality

SCSIVue Cables \$39
 • Triple Shielding (Unique Design)
 • Double Gold Plated Connectors
 • Diagnostic Indicators • Charge Ferrite Filters
 • Extra Heavy 26 Gauge Wire • 100 Styles in Stock

Custom Teflon® Internal Cables
 • Less Errors, Ultimate Performance
 • Silver Wire Improves Signal Quality
 Features:
 • Perfect 90 Ohm Impedance • Custom in 1 Day
 • Triple Pronged Connector • Gold contacts Silver Wire

Diagnostic Adapters
 • 68 Pin Drive to 50 Pin IDC (master/slave driver as required)
 • 68 Pin External Adapter to 50 Pin (connects host adapter)
 • Gender Changes both 50 and 68 pin all combinations
 • Adapters with parallel termination for 68 pin SCSI controllers

Ultra SCSI Cases & Accessories

SCSI Cable Tester - 100 Readout
 This Digital SCSI Cable Tester tests all the popular cable styles for opens, shorts, and unreliable operation. Battery powered for easy use.

CIRCLE 768 ON READER SERVICE CARD

Seismic Proven 9-Track

Automated Backup Data Interchange Storage Management

4mm 8mm

Tape Libraries

NEW 3490E

QUALSTAR
 800-468-0680
 www.qualstar.com
 FAX: (818) 592-0116
 TEL: (818) 592-0061

CIRCLE 769 ON READER SERVICE CARD

ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP

MULTI-MEDIA STORAGE CENTER
 SOLID OAK AND OAK VENEER PLY

HIGHEST QUALITY
159.90 +S/H

QH AND CRAFTED
QTEMPERED GLASS
Q5 ADJUSTABLE SHELVES
QSATIN LACQUER FINISH
QHOLDS 288 CD'S
OR 114 VHS
Q3 COLORS TO CHOOSE FROM

EARLY AMERICAN
DARK WALNUT
BLACK

QBLACK OR BRASS HARDWARE
QTINTED GLASS AVAILABLE FOR AN ADDITIONAL FEE
QCUSTOM SIZES AVAILABLE
PRICES VARY

ADVANTAGE WOOD SHOP

OTHER FINE PRODUCTS AVAILABLE

AUDIO/VIDEO FURNITURE TO MATCH
OFFICE FURNITURE
ENTERTAINMENT FURNITURE
CUSTOM
HOME THEATRE ENVIRONMENTS

RETAIL STORE FIXTURES
SPEAKER STANDS
DESIGN SERVICES
FINISH SERVICES
PANEL PROCESSING

1-800-447-0419
84 AERO DR. BUFFALO, NY 14225

ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP ADVANTAGE WOOD SHOP

www. OR CIRCLE 771 ON READER SERVICE CARD



Today's Storage

PD isn't just a high-capacity, removable storage solution... By utilizing **rewritable** DVD technology, it's designed with the future in mind. That's why manufacturers of advanced systems like Compaq's Deskpro and the IBM PC 365 model 14U include the PD.

They know PD gives their users the features they need:

- A whopping 650MB of storage on a single, rewritable disk
- Unlimited storage for about 4.5¢/MB – just add another disk
- Rugged, reliable storage that isn't affected by head crashes, stray magnetic fields, harsh environments, or rough handling
- Easy storage of video, audio, graphics, and Internet files
- Unlike CD-R, PD media is **rewritable**
- PD media has a data life of 30+ years



Compaq Deskpro with PD Drive

- And, they'll be able to read their PD media with future Panasonic DVD-RAM drives

Use it for low-cost, reliable storage of desktop publishing work, prepress production files, multimedia development, Internet file downloading, and backing up your system.

The versatile PD also plays your CD-ROMs, CD-R, photo-CDs and even audio CDs...flawlessly.

PD, the 650MB **rewritable** optical drive with economical, easy to use, removable media and built-in CD-ROM.

For the storage solution that meets your needs today and tomorrow, visit the Compaq, IBM, Panasonic web sites; or call us for the name of the authorized PD dealer nearest you.



IBM PC 365 Model 14U with PD Drive

Make the Connection

Featuring D-Link networking Products

Adapters, switches, hubs, routers, ...All your networking product needs from the company with the

"Commitment to Connectivity"
are now available at internet-direct prices

ibuydirect.com

Presentation Products from Setec

Remote Wireless Mouse with Laser Pointer and Screen Annotation Software, PC-to-TV Converter, and Data-grade 29" Presentation Monitors

<http://www.ibuydirect.com>

SETEC

CIRCLE 772 ON READER SERVICE CARD

TAKE CONTROL OF 2 to 64 SERVERS

FROM ONE KEYBOARD, MONITOR AND MOUSE

- Any mix of PCs; Macs & Suns
- Over 50,000 in operation worldwide

MasterConsole®
Rock solid, reliable control



CALL TODAY! 800-RCI-8090 Ext 81

RCI Europe (31) -10-284-4040 RCI Taiwan (886)-2-218-1117
fax (31) -10-284-4049 fax (886)-2-218-1221

Raritan

Raritan Computer, Inc. E-mail sales@raritan.com Tel 908 764.8886
400 Cottontail Lane http://www.raritan.com Fax 908.764.8887
Somerset, NJ 08873

30-DAY MONEY BACK GUARANTEE FULL 1-YEAR WARRANTY
CIRCLE 773 ON READER SERVICE CARD

HUNDREDS OF ADS

For Hardware, Software,
Supplies and Services

<http://www.marketplace.zdnet.com>

Net Marketplace™

Solution For...

Tomorrow's Technology.



- 650MB removable media
- Rewritable optical drive
- Built-in CD-ROM

COMPAQ
www.compaq.com

IBM
www.ibm.com

Panasonic
(800) 742-8086 Ext. PD
www.panasonic.com/alive

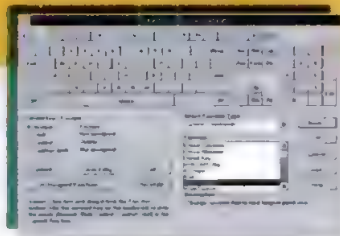
© 1996 Panasonic. All rights reserved. The IBM logo is a registered trademark of International Business Machines Corporation. The Compaq Deskpro and Compaq Logo are registered trademarks of Compaq Computer Corporation. All other copy rights or trademarks are property of their respective owners.

Ref PD-B

www. OR CIRCLE 793 ON READER SERVICE CARD

Distinct IntelliTerm

Integrated Terminal Emulator for DEC and IBM® Systems



Highlights:

- TN3270 Emulation—Models 2,3,4 and 5 (for IBM Mainframes)
- 31796 Vector Graphics & 3279S36
- TN5250 (24x80, 27x132) (for AS/400)
- VT52, VT100, VT220, VT320 & VT420 emulation (for DEC and UNIX Systems)
- Customizable keyboard layouts, poppads and session profiles
- VBA™ Advanced Scripting Language
- DDE, HLLAPI, EHLLAPI, WinHLLAPI and Visual Basic™
- Available for Windows 3.11, Windows 95 and Windows NT

distinct
The world leader in Internet development tools.

408.366.8933
http://www.distinct.com
Fax: 408.366.0153
E-mail: sales@distinct.com

Distinct is a registered trademark, and Distinct IntelliTerm is a trademark of the Distinct Corporation. Copyright © 1996 Distinct Corporation. All rights reserved. IBM, AS/400, and Windows are trademarks of International Business Machines Corporation. All other trademarks are the property of their respective owners.

CIRCLE 775 ON READER SERVICE CARD

Keep your PCs up & running with the 100% accurate fix...



Micro-Scope is a universal PC diagnostic that runs a proprietary O/S which eliminates DOS limitations and inaccuracies. Version 6.16 adds 25 enhancements and includes: IDE low-level format, accurate IRQ conflict display, cache memory test, 64 meg video memory test, data recovery capabilities, virus capabilities and super-fast hard drive testing.

Post-Probe is a universal P.O.S.T. (Power-On Self-Test) reader card for the "dead" PC. Post-Probe includes: MCA adapter, tri-state logic probe, 13 LED pre-POST test, 2-digit POST code display and a manual with a full explanation of the manufacturer POST codes down to the exact device or chip failure.

Micro 2000, Inc.
1100 E. Broadway, 3rd Floor
Glendale, CA 91205
Toll Free 1 (800) 864-8008
Fax (818) 547-0397
http://www.micro2000.com



www. OR CIRCLE 776 ON READER SERVICE CARD

A PROJECTOR SO LIGHT YOU CAN TAKE IT ANYWHERE.

Especially Now That You Can Afford To.



First we made a notebook projector light

Just plug it into your notebook, turn it on, and you're

and portable enough to take on

ready to make a big presentation. You'll

the run. Then we made it considerably less

not only get all the power and

expensive than any comparable SVGA

brightness you need, but at a mere 9.3 pounds,

projector on the market.

you'll have the flexibility to take it anywhere

And just like our entire

you want. Because there's no bad place to

family of projectors, it's incredibly easy to use.

present a good idea.

L I G H T W A R E



For a free demo, call 1-800-445-9396 or visit our website at www.lightware.com

Valid for VHS only. Price subject to change without notice. In U.S. Dollars and valid only in the U.S. Available at participating dealers.



CIRCLE 780 ON READER SERVICE CARD

Training Videos for Windows Software

KEYSTONE LEARNING SYSTEMS CORP.



Dan Balter
Microsoft MCSE &
Windows NT Instructor



Dennis Taylor
Microsoft Excel Specialist
& Excel Instructor



Dawn Bjork
Microsoft Certified
& Word Instructor



Alison Balter
Microsoft Certified Developer
& Access Instructor

Windows 4.0

Serv. Ad. Lev 1-2 (ea) \$89.95
Covers Exam 70-87
Entrep. Ad. Lev 1-2 (ea) \$89.95
Covers Exam 70-88
Special All Four \$329.95
Serv. & Writ. Install \$89.95
Covers Exam 70-83 & 70-73
Worksta. Admin. Lev 1 \$89.95
Worksta. Admin. Lev 2 \$89.95
Worksta. Admin. Lev 3 \$89.95
Special All Four \$329.95
Covers Exam 70-73
Worksta. User Level 1 \$49.95
Worksta. User Level 2 \$49.95
Retail Videos \$89.95
Special All Ten \$669.95

Excel 97

Beginning Intermediate \$49.95
Advanced \$49.95
Power Features \$49.95
Pivot Tables \$49.95
Shortcuts & Ideas \$49.95
Special All Six \$239.95

Word 97

Beg/Int/Adv (ea) \$49.95
Special All Three \$129.95
Desktop Publishing \$49.95
Mail Merge \$49.95
Tables & Forms \$49.95
Internet \$49.95
Special All Seven \$279.95

Windows 95

Beg/Int/Adv (ea) \$49.95
Special All Three \$129.95
Networking 49.95
Installation 49.95
Special Features 49.95
Special All Six \$239.95

Lotus SmartSuite

Lotus SmartSuite 97 Plus (16 videos/28 hours) \$579.95
Lotus SmartSuite 97 Pro (13 videos/24 hours) \$495.95
Lotus SmartSuite 97 Standard (9 videos/17 hours) \$349.95

Corel Office

Corel Office Professional 8 (16 videos/28 hours) \$579.95
Corel WordPerfect 8 Suite Pro (13 videos/24 hours) \$495.95
Corel WordPerfect 8 Suite Standard (9 videos/17 hours) \$349.95

Internet Explorer

Internet Explorer \$49.95

Netscape Navigator

Netscape Navigator \$49.95

KeyNotes

Over 500 titles

Other versions available
Courses may vary call for pricing

Domestic Shipping 3-5 Days \$5.00 for the first five videos plus \$1.50 for each additional video title

30 DAY Money Back Guarantee

4 Easy Ways to Order:

CALL 1-800-775-5925
801-375-8680

FAX 1-801-373-6872

WWW www.klscorp.com

MAIL Keystone Learning Systems Corp.
2241 Larsen Parkway • Provo, UT 84606

AD# PM87

AD# PM87

GET MCSE, CNE OR A+ CERTIFIED... FAST!

The ForeFront MCSE Self-Study Course™

Ensures the highest rate of retention so that when you complete your training you'll be fully prepared to pass your MCSE exams. You'll be ready and confident to go into the workplace to effectively plan, implement, maintain and support information systems in a wide range of computing environments, using Windows NT and other Microsoft Server products.

The ForeFront A+ CERTIFICATION Self-Study Course™

Getting A+ Certified will help open the way to further advancement in the corporate world. A+ Certification is the new required standard for PC Repair Technicians. This hands-on self-study course will give you all the technical material, knowledge, interactive exercises, and confidence you'll need to pass your exams and excel in today's competitive PC repair marketplace!

The ForeFront CNE Self-Study Course™

Provides fast, effective and convenient training to anyone wishing to become a Certified NetWare Engineer, even when hampered by a busy schedule. Our CNE CBT allows you to learn everything you'll need for full NetWare certification.

The ForeFront A+ CERTIFICATION Self-Study Course™

Getting A+ Certified will help open the way to further advancement in the corporate world. A+ Certification is the new required standard for PC Repair Technicians. This hands-on self-study course will give you all the technical material, knowledge, interactive exercises, and confidence you'll need to pass your exams and excel in today's competitive PC repair marketplace!

Bonus!!!

Buy Any Two CBTs and get The Micro House Technical Library™ FREE

Call for Special Discount Pricing Today!

1-800-475-5831

(813) 724-8994 • FAX (813) 726-6922 PM
25400 U.S. Hwy. 19 N., #285 Clearwater, FL 33763

Free Technical Support

Next Day Shipping

Performance Guaranteed

FOREFRONT™ DIRECT

The Best Accounting for the Best Businesses!

Designed to automate your business, U.A. Corporate Accounting™ is the most powerful customizable accounting software available today!

Accounts Receivable
Accounts Payable
General Ledger
Order Entry
Payroll
Inventory
Job Costing
Purchase Order

Unlimited Access
To Your Information!

Completely customizable using Microsoft Access, the U.A. Corporate Accounting system is a virtual part of the Microsoft Office suite. 32-bit software designed for Microsoft Windows 95, Microsoft Windows NT, Microsoft SQL Server™.

UA
Corporate
Accounting

1-800-859-8607

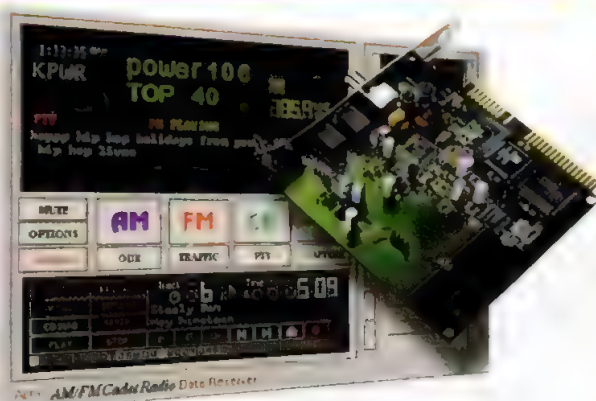
Phone (504)851-6600
Fax (504)851-6007
Advanced Software
Development Corp.

CIRCLE 781 ON READER SERVICE CARD



CADET Data Radio

AM/FM Radio and Data in your PC



AM/FM stereo receiver featuring RDS (Radio Data System) which displays data sent via radio broadcasts. The CADET produces home-stereo quality audio so you can work or relax the way you listen to music or the ball game.

- Installs in seconds - Plug and Play
- Display of station call letters, artist name, song title and other data
- Seek/Scan by station format (rock, jazz, talk, country, etc.)
- 106 FM presets - 50 AM presets
- Radio on Demand™ (VCR-like programmed recording of radio programs)
- Future software enhancements include radio paging, e-mail alerts, and more

For more information or a dealer nearest you call:

1-800 888-5244

Sales: (562) 926-1928

FAX: (562) 926-0518

Literature FaxBack Service: (562) 926-5207

Visit our website at <http://www.ABSTECH.com>



CIRCLE 782 ON READER SERVICE CARD

Display SVGA on your TV!

TV SuperScan2 converts SVGA (1024 x 768) into a video signal. This scan converter has exclusive Video Buffer Technology and will work with any operating system or platform using SVGA.

- View with native and remote control
- Supports 1024 x 768 in up to 18.7 million colors
- On Screen Menu
- Broadcast quality (RS 170) for video broadcasting or taping
- Now with Zoom, Draw, Screen Capture and more!



For more information
or a dealer nearest you call:

Literature FaxBack Service: (562) 926-5207
Visit our website at <http://www.ABSTECH.com>

1-800 888-5244

Sales: (562) 926-1928

FAX: (562) 926-0518

CIRCLE 783 ON READER SERVICE CARD

Finally! Windows 95 and Macs Share Files and Printers Both Ways

Workgroups and small offices can now operate as efficiently as an enterprise with **PC MACLAN for Windows 95**. Low cost, plug and play installation, Network Neighborhood and long file name support, are just a few of the features that make sharing files, volumes and printers between Macs and PCs a snap.

"For peer-to-peer networking... **PC MACLAN 6.0** is the only choice."

Macworld Nov 96

Create your own network or complement almost any pre-existing LAN. Sharing information between Windows 95 and Macintosh users is as easy as working off your local hard drive. Print jobs go to the printer of your choice regardless of its location on the network.



For ordering or information:

800-862-2526

e-mail: sales@miramarsys.com

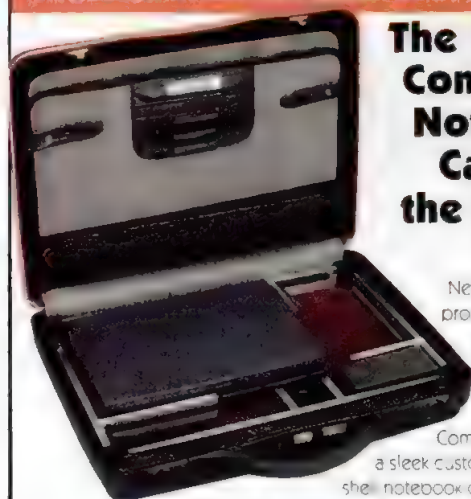
Web: www.miramarsys.com



Please visit us at these upcoming shows:
Seybold SF - Oct. 1-3, Booth #2431
Cue - Oct. 16-18, Booth # 902

CIRCLE 784 ON READER SERVICE CARD

The Hottest Concept in Notebook Cases on the Market Today!



Never has hard-shell protection looked so good - and been so affordable. The Showcase Adjustable Compartment Case is a sleek custom molded hard-shell notebook carrying case with the Smart Track System permanently mounted inside.

This system gives you the flexibility to create any size compartment you may need for your notebook, and accessories - and the option to change these compartments as often as you wish.

**HARD-SHELL PROTECTION...
SOFT-SHELL PRICE.**

\$179.95

INCLUDES SHIPPING AND HANDLING
UPS Ground - Next Day and Second
Day Air Available



Carrying You into the Future!

Let the Showcase Model "SH-1" carry you into the future with the permanent vinyl-lined interior frame 1.6" high 3.4" wide 10.5" deep and 10.5" long. Carry it in the Showcase Model "SH-1" and you'll be carrying the future.

1-888-268-5441

www. OR CIRCLE 792 ON READER SERVICE CARD

High performance web hosting at low performance prices

PLANS FROM
\$24.95
PER MONTH

(800) 339-HWAY
www.hway.net
(561) 989-8574



Hway Technologies
THE WORLDWIDE LEADER IN WEB HOSTING

- ✓ 3 T3 lines to diverse backbones
- ✓ Silicon Graphics WebFORCE Servers
- ✓ Industrial-strength Cisco routers
- ✓ 99.5% uptime—guaranteed!
- ✓ Uninterruptible power
- ✓ 24 x 7 network operation center
- ✓ 40 terabyte tape archive system
- ✓ 24 x 7 multilingual support
- ✓ Accounts set up within a few hours
- ✓ Domains registered within 24 hours
- ✓ 30 day money back guarantee
- ✓ Serving over 30,000 domains

www.hway.net OR CIRCLE 786 ON READER SERVICE CARD

Is your business on the Internet? 1-800-749-1706

World Wide Web Commercial Virtual Hosting Services

- 40 MB of disk space for your html & graphics (30 MB per MB over 40 MB)
- 600 MB Data transfer per month (300 MB per MB over 600 MB)
- FREE! Support for custom CGI scripts
- Domain name registration with InterNIC
- FREE! Unlimited e-mail address forwarding
- Real-time web site statistics
- Full T3 to the internet

IMC
Interactive Multimedia
Corporation

www.imconline.com
hosting@imconline.com

per month
\$24.95

COMING SOON! Support for web based chat, news, commerce, & personalization.

CIRCLE 787 ON READER SERVICE CARD

The Most Advanced Internet Service Available

Online Marketing — Full Service Web Marketing

\$18.95/month FREE EXTRAS WWWboard installed • Guestbook installed Free for all links page installed

- True virtual domain
- http://your-name.com/
- Access to our SSL
- Full POP mailbox
- Unlimited Email aliases
- Unlimited Infobots
- 3 Gigs of monthly transfer
- 50 megs of space
- Anonymous FTP site
- Weekly usage stats
- Your own cgi-bin full of scripts
- Front page supported

ADVANCED WEBPAGE ADMINISTRATION!

Visit us for same day setup—**www.olm.net**
Contact us **sales@olm.net** or **800-741-6813**

CIRCLE 788 ON READER SERVICE CARD

Web Hosting **\$16.95**

Masterpiece
Web Creations

E-mail Accounts
Domain Name Registration
(www.YOURNAME.com)
Site Design and Assistance
FrontPage Support
Database Connectivity
Access to Secure Server
Credit Card Transaction Hosting

No Minimum Contract
Resellers get HUGE discounts!

Reiter Associates, Inc. **www.reiterassoc.com**
1-800-203-5767 email: **sales@reiterassoc.com**

CIRCLE 789 ON READER SERVICE CARD

Do you want to make money with the Internet?

simplicity profitability security

NO HASSLE WITH
ADDITIONAL SOFTWARE
OR PROGRAMMING
EVERYTHING'S MANAGED
THROUGH COLLECT.COM
SERVERS

FREE
EVALUATION!



ALL COMMON CREDIT
CARDS ACCEPTED, BUT
CARD NUMBERS NEVER
APPEAR ON THE INTERNET.

PURCHASE OF CREDITS
IS DONE OFF-LINE ON A
100% SECURE TOLL FREE
TELEPHONE PLATFORM

Control your website with COLLECT PAYMENT SYSTEM

www.collect.com OR CIRCLE 785 ON READER SERVICE CARD

PUT YOUR BUSINESS ON THE WEB! WEB HOSTING \$19.95 Per Month

- Unlimited E-mail Forwarding
- Domain Name Registration available (www.your-company.com)
- 1000 MB of Data Transfer per Month
- 50 MB Storage for html Documents and Graphics
- Full Redundant T3
- Tons of Web Tools and Wizards
- Real Time Reporting on Web Site Activity
- Support for Custom CGI Scripts
- Support for MS FrontPage 97
- Self Directed Control Center™
- Resellers Welcome

SLIPNET

1-800-SLIP.NET
Int'l: 415-536-6197

www.slip.net Order OnLine!

www.slip.net OR CIRCLE 790 ON READER SERVICE CARD

602proINTERNET

- MAIL SERVER/SMTP-POP3 GATEWAY
- LOCAL ENCRYPTED MAILBOXES
- FIREWALL/PROXY SERVER
- SUPPORTS MICROSOFT AND NETSCAPE BROWSERS

WWW.SOFTWARE602.COM/WIN.HTM

Acting as both a Firewall/Proxy Server and Mail/SMTP-POP3 Server, 602proINTERNET provides full internet connectivity to all of your network users so they can enjoy the benefits of having full Internet access including Web Browsing and E-Mail

Software602, Inc.
6821 Southpoint drive North
Jacksonville, FL 32216
fax: 904-296-9392
tel: 904-296-7700
email: **info@software602.com**



www.software602.com OR CIRCLE 791 ON READER SERVICE CARD

Work Coast to Coast!

The First and Only Laptop Battery in Use Longer Than Your Typewriter

**Announcing the 1-800-Batteries Portable Power Pack**

- Ultra thin and lightweight
- Built in power gauge
- Works with any laptop
- \$179.00

call for our free product catalog

Batteries and Tools for Mobile Professionals™**1-800-Batteries™**
1-800-228-8374save \$2, order on the web www.800batteries.com

www. OR CIRCLE 551 ON READER SERVICE CARD

RIYC**YOU NEED A COMPUTER
WE WANT TO SELL YOU ONE**

Pentium/Cyrix/Multimedia Systems from \$549 or LESS!
Pentium Class MMX/AMD Multimedia Systems from \$699 or LESS!
Pentium Pro Multimedia Systems from \$1099 or LESS!

We Will Beat Any Legitimate Dealer Pricing! Tell Us Where You Saw It Cheaper

Basic Multimedia Systems Include: Pentium Class Intel Vx/Hx/Tx MB w/512K pipeline burst
• 16MB RAM • 2.1 GIG IDE Hard Drive • 1.44 Floppy Drive • 64-Bit 2MB SVGA Card

Your Choice: 8x4 CD-ROM Changer or 20x CD-ROM

- 16-Bit Sound Blaster-Compatible Sound Card • Win95 Keyboard • Microsoft-Compatible Mouse
 - Speakers • Mini-Tower Case w/230W Power Supply • 30-days Parts/Labor, One Year Parts Warranty
- Please call for latest pricing and free catalog.

For the most up-to-date and accurate pricing see our website at:
<http://www.riyc.com>—Lowest Prices on the Net!

Call 800-342-7991 Orders only!

718-325-0932 General Information 718-325-3141 24-Hour Fax Orders/Info

RIYC Computers Inc. • 1929 Edenwald Ave. Bronx, NY 10466 *Prices subject to change without notice

CIRCLE 552 ON READER SERVICE CARD

MMX Deals

Motherboard w/512K and Intel Pentium + Cooling Fan
166MHz - US\$ 240
200MHz - US\$ 355
Add a Case to any of the above for US\$ 40.00 More

We are an Intel Processor Dealer

CPUs	100	133	166	200	233
Pentium	\$91	\$114	\$148	\$229	N/A
MMX	N/A	N/A	\$167	\$295	\$441
AMD K5	\$84	\$77	N/A	\$104	N/A
AMD K6	N/A	N/A	\$168	\$230	\$363
Pentium II	233 Mhz	\$ 636	266MHz	\$851	

Motherboards	
Triton 430VX for Pentium MMX - AMD K5/K6	\$85
Triton 430TX for Pentium MMX - AMD K5/K6	\$105
Zida 5MX for Pentium II NEW!!!	\$205
Zida 5MX for Pentium II NEW!!!	\$205

Video

Trident 9680 1MB \$25 S3 Virge AMB PCI \$55

DLP Computers

800-241-2093

www.dlpcomputers.com

Mon to Fri 12 pm to 8 pm EST and Sat 10 am to 4 pm

Circle 553 ON READER SERVICE CARD

**Highest Quality
Best Pricing****UPGRADE GROUP**800-718-7888
714-380-4843

University
Government
Corporate
P.O.'s accepted

Kingston
TECHNOLOGYwww.upgrade.com

www. OR CIRCLE 554 ON READER SERVICE CARD

DEM COMPUTERS**WHOLESALE TO THE PUBLIC**

Quality Parts Quality Service Quality Computers

Motherboards

Octek Rhino-12	\$89
Abit Jumperless 512K	\$149
Asus P55T2P4	\$149

Memory

16 Meg 72 Pin EDO	\$59
32 Meg 72 Pin EDO	\$109
16 Meg 10ns SDRAM	\$85
32 Meg 10ns SDRAM	\$129
64 Meg 10ns SDRAM	\$345

Hard Drives

1.2 GB	\$145	1.6 GB	\$155
2.1 GB	\$169	2.5 GB	\$179

Systems

You name it. We build it.
Call for a custom quote today

www.demcomputers.com**972-612-1443**

Fax 972-612-8528

3131 Custer • Plano TX • 75075

www. OR CIRCLE 555 ON READER SERVICE CARD

1-800-4 MEMORY**MEMORY
SELL•BUY•TRADE**

**WE CAN BEAT
ANY QUOTED PRICE
IN THIS MAGAZINE
FOR MEMORY!!!**

- Lifetime Warranty
 - No Credit Card Surcharge
 - No Restocking Fee
- CALL AROUND THEN CALL US!!!

[HTTP://18004MEMORY.COM](http://18004MEMORY.COM)

CIRCLE 556 ON READER SERVICE CARD

72 PIN SIMMS (72P, EDO)

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

DIMMS (168 pin)

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

APPLE POWER MAC

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

DELL OPTIPLEX 6800/200

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

DELL POWER EDGE 1100/4100

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

MOTOROLA (Apple Compatible)

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

SIMM MODULES (72 pin)

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

**TOP
DOLLAR
PAID****MEMORY!
BUY, SELL, TRADE, UPGRADE.****We'll BUY your excess or new computer memory. We BUY Back All Types of Memory...**

72 pin, 168 pin, 30 pin, SIMMS, DIMMS, Notebook Memory. Any type of memory, working or not.

Also we Buy Back working Hard Drives and CPU chips. Call us and get a price.

NOTEBOOK & LAPTOP MEMORY

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

TOSHIBA LAPTOP MEMORY

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

**CALL
for CPU's
and Hard
Drives****The Memory Liquidators****(800) 718-7755**Web: www.memoryliquidators.com or E-mail: sales@ml.win.net

531 Main St., El Segundo, CA 90245 Ph. 310-326-5656 • Fax 310-326-7790 • M-F 8:00 am to 5:00 pm PST

Prices subject to change without notice

CIRCLE 557 ON READER SERVICE CARD

NOTEBOOK, LAPTOP MEMORY

Model	Price
16MB	\$1.99
32MB	\$2.99
64MB	\$4.99
128MB	\$9.99
256MB	\$19.99

**Laser Printers
• PCMCIA
• Motherboards
• CDROMs****Gov't
Educational
P.O.'s &
Credit
Cards**

HiQ

YOUR COMPUTING SOLUTIONS PARTNER
Corporate, Government, and
Educational POs Welcome

HiQ K6-PR200 AMD K6-PR200 MHz

- Intel 430TX Chipset
- PC Power & Cooling Heat Sink
- 16MB EDO RAM
- 1.44MB Floppy Drive
- 1.7GB EIDE Hard Drive
- Matrox Mystique 2MB SGRAM Video
- I2X CD-ROM Drive
- Soundblaster 16 Sound Card
- Windows 96 CD-ROM Version
- Office Professional 97 CD-ROM
- ATX Mid Tower Case
- Labtec CS800 Speakers
- 104 Keytronics PS/2 Keyboard
- Microsoft PS/2 Serial Mouse
- 15" Panasonic S15 Monitor
- HiQ Warranty: Three Year Parts, One Year Labor

AMD



\$1389

UPGRADES

- Upgrade to 32MB EDO RAM.....\$49
- Upgrade to 17" Panasonic S17\$229
- Include US Robotics 33.6 Fax/Modem\$89

CALL FOR LATEST PRICING!

**LOCATIONS
NATIONWIDE**
SUNNYVALE, CA
800.827.5836

SAN ANSELMO, CA
800.929.1893
ATLANTA, GA
800.875.2882

BOSTON, MA
800.249.1886
CHICAGO, ILL
800.819.4588

DENVER, CO
303.338.1300
SACRAMENTO, CA
916.635.7842

HiQ

Next Day
Shipment on
Advertised
Systems*

1.800.827.5836

www.hiq.com

**3 Year
Limited
Warranty**

Rite-Way Computers

Don't Kill It Upgrade It!!

We Carry Bare
Bones Kits,
Hard Drives, Memory,
Video Cards, Modems,
And Much Much More!!
Visa / Mastercard / Discover
No Surcharge!
Call for Latest Pricing
360-240-0981

Visit Our Web site
www.rwcomputers.com

OR CIRCLE 566 ON READER SERVICE CARD

Best Price/Performance Solutions

Undecoded Wand.....	\$39.00
Wedge/Serial Decoder.....	\$89.00
Undecoded CCD.....	\$109.00
Keyboard Wedge CCD.....	\$129.00
Undecoded Slot Reader.....	\$89.00
Keyboard Wedge Slot Reader.....	\$139.00
Undecoded Magstripe Reader.....	\$39.00
Kbd Wedge Magstripe Reader.....	\$129.00
S9-Key Programmable Kbd.....	\$99.00
16" Customer Display (20x2).....	\$129.00
Serial Cash Drawer.....	\$129.00
Undecoded Laser Scanner.....	\$229.00
Kbd Wedge Laser Scanner.....	\$259.00



30 Day Money Back Guarantee
Same Day Shipping
Free Technical Support
Dealer Discount Available

FAMETECH AMERICA, INC.
Tel: (512) 331-4650 Fax: (512) 331-7810
E-mail: tyssso@aol.com (800) TYSSO-ID
Internet: http://members.aol.com/tyssso

CIRCLE 567 ON READER SERVICE CARD

MBS COMPUTERS

Micro Business Systems Inc.
#110, 7110 - 120th Street, Surrey, B.C., V3W 3M8
Tel: (604) 572-8722 Fax: (604) 572 9666

IBM Compatible Computer Systems Custom built to your own SPECIFICATIONS

You simply choose what you want,
we will build, configure and install it for you

**What you want is
what you get!**

Committed to quality.....Focused on price.



MOTHERBOARDS
VGA CARDS
SCSI CONTROLLERS
CPU & RAM
NOTEBOOK RAM
HARD DRIVES
FLOPPY DRIVES
CD ROM DRIVES
FAX-MACHINES
FAX-MODEMS

KEYBOARDS
MOUSE & GLIDE PADS
SOUND-CARDS
PRINTERS
DIGITAL CAMERAS
CASES
SOFTWARE
GAMES
.....and much more!

#110, 7110 - 120th Street, Surrey, B.C., V3W 3M8 Tel: (604) 572-8722 Fax: (604) 572 9666

For further information visit our WEB site.
www.microbiz.net or e-mail us at sales@microbiz.net

CIRCLE 564 ON READER SERVICE CARD

BASIC SYSTEMS FOR BUSINESS & STUDENTS

- Triton III MB w/ 512K Pipeline Burst Cache
- AMD K5 100 CPU w/ Fan
- 8MB 60ns 72 pin DRAM
- 1.2 GB EIDE Hard Disk
- 28.8 Fax Modem
- 1.4 MB Floppy Drive
- Trident Video Card w/ 1MB
- PCI EIDE Controller w/ IO 16550
- Super A Mini Tower w/ Display
- 104 QTRONICS Keyboard for WIN 95
- Mouse w/ Pad, only system 5% OFF w/ student ID \$479
- AMD K5-100 K 100 \$519.499
- AMD K6 MAX200-100 \$710.649
- MMX P5-233 200 100 \$1,139.799.649
- Pentium 200 166/150/133 \$669.359.499
- INTEL PII 233/266 MHz ...[ocm] \$1,439.1283
- [ocm] /1229.1340

We accept any of your PC's configuration. Upgrade
Hardware & Software. We provide network systems

Call for the best prices on more Systems,
Motherboards, Cases, CPU's, Hard Drives,
Memory, Monitors, Printers & Software

800-714-4371
2 BG COMPUTER

3060 Scott Blvd. • Santa Clara, CA 95054
408-988-2968 Fax 408-988-2686
<http://www.infinet.com/~ilbgcom>
Email: 2bgcom@infinet.com
Business Hours M-F 9-6, Sat 10-5 PST

OR CIRCLE 565 ON READER SERVICE CARD

POS Printers/Cash Drawers



Low-Cost POS Solutions.

- POS compulsory drawers
- Samsung SRP-100 series POS receipt printers. • 3.2 lines/second. • Cash drawer kick-out

CRS
1-800-423-4949 ext. 433
Anthony Lane
Minnesota 55

OR CIRCLE 566 ON READER SERVICE CARD

bar coding windows

bar code fonts \$149

TrueType & Postscript fonts. Choose from 8 types. Code 39, 128, Codabar, MSI/Plessey, IM 2 of 5, Postnet, UPCA/EAN.

labelworks \$279

Labels with text, graphics & bar codes. Import data from spreadsheets, databases, or other applications.

wand reader \$229

Handheld wand reader with built-in memory.

ccd reader \$295

Handheld CCD reader with built-in memory.

laser reader \$495

Handheld laser reader with built-in memory.

Call for FREE information

512.219.7768

Fax: 512.219.7769
sales@riversedge.com
http://www.riversedge.com

riversedge

CIRCLE 565 ON READER SERVICE CARD

PORTABLE PRODUCTS

YOUR COMPLETE SOURCE FOR
BAR CODE AND HANDHELD
DATA COLLECTION SYSTEMS

- BARCODE READERS - Keyboard wedge, RS-232, PC, Mac. Most data terminal interfaces
- INPUT DEVICES - Laser, CCD, Wand, Slot, Magstripe - All available with built-in decoder
- PORTABLE HANDHELD READERS - DOS & Windows Application Generators - No programming experience needed. Develop your Application in minutes
- Printers, Verifiers, Label Software, Labels, Plug-N-Play RF Systems, Wireless PDA's

FREE UNLIMITED 800 TECH SUPPORT
UNCONDITIONAL SATISFACTION GUARANTEE
CALL FOR FREE CATALOG

1-800-849-0958

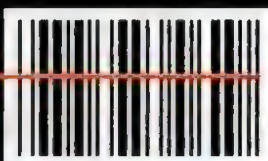
http://www.portableproducts.com

PORTABLE PRODUCTS

8401 K Mayland Drive • Richmond, VA 23294
phone: 804-346-0111 • fax: 804-346-0196

CIRCLE 570 ON READER SERVICE CARD

ONE STOP





symbol
CERTIFIED VAR

Free!
Guide to
Bar Coding
CALL NOW!

BAR CODE

Bar Code Scanners

Portable Data Terminals

Bar Code Printers/Media

Software Solutions

Great Prices PLUS Total System Support



StrandWare
Bar Code Printing Software



Monarch
Marking Systems



DATA RECOGNITION INC.

www.datarecognition.com
512-349-6201 fax
sales@dri.com
2929 Longhorn Blvd., Suite 103
Austin, TX 78758-7628

Resellers Welcome



Same-day shipping* of in-stock products from Symbol Technologies, Monarch, StrandWare and all major manufacturers.

Easy to Order • Call 800-541-9645

*ORDER BY 3 P.M. CST

www. OR CIRCLE 572 ON READER SERVICE CARD



International Technologies & Systems is a complete solutions provider and long-term partner to industry, government and retail.

GSA Listed

Magnetic Stripe Readers from \$79

Portable Data Collectors from \$499

Wand, CCD & Laser
Complete Scanning Solutions from **\$99**

CALL TODAY!

EAST 800-826-1688
WEST 800-228-9487
+1-714-990-1880

12th Anniversary

Quick Set-up • No-Risk Policy • Free Technical Support • Same Day Shipping

CIRCLE 571 ON READER SERVICE CARD

Barcoding just got a lot easier...

Keyboard Wedge Solutions

- Hand-Held Laser
- 60mm or 80mm CCD
- Hewlett Packard Wand Reader

FREE Bar Code with Purchase

SOFTWARE SUPPORT
CUSTOM SOLUTIONS
POS PERIPHERALS
SERVICE & REPAIR



DATA VISION
Office's Nationwide

1-800-375-9063
215-396-0308
www.data-vision.com

Call For Our Free Catalog

www. OR CIRCLE 573 ON READER SERVICE CARD

Bar Code Headquarters

Labeling Software

For LaserJet, DeskJet, etc.

For Windows
and DOS!



- Any Format, Any Label. WYSIWYG Design
- Formats for Sears, K-Mart, Penney's, WalMart, TCIF, Logmars, EIA, AIAG, etc.
- Prints Bar Codes: UCC/EAN-128, Code 128, UPC/EAN, 2 of 5, MSI, Codabar, Code 39
- Simple Custom Operator Interface
- LabelRIGHT™ for Windows™ - \$295
- LabelRIGHT™ for DOS - \$279

Bar Code Fonts for Windows™

- Insert bar codes into any font based Windows program by Clipboard or Hot Key.
- Prints UPC/EAN, UCC-128, Code 128, Codabar, Code 39, Interleaved 2 of 5
- For dot-matrix and laser printers - \$199

Bar Code Readers

for IBM PC, Mac and RS-232 Terminals



- Attaches as Second Keyboard
- Add Bar Code Reading to any Software
- For Windows, DOS, Novell, UNIX, Mac OS
- Code 39, UPC/EAN, 128, 2 of 5, Codabar, 93
- Wand, Magstripe, CCD, Slot Badge or Laser
- Top Rated by Independent Reviews
- Complete Reader with Wand only - \$299
- Cordless "Laser-Like" CCD Scanner - \$599
- Complete Integrated Laser Scanner - \$649

Portable Bar Code Readers

for IBM PC, Macintosh, and Serial Interface Computers

WITH
VOICE!

- Battery Operated Batch Data Collector
- 64K or 256K Data Storage
- Display messages & voice messages prompt operator.
- Pick lists, tables.
- Wand, CCD or Laser Scanner
- Code 39, UPC/EAN, 93, 128, Codabar, etc.
- Very Easy to Create Custom Prompts
- Small Size-Weighs only 12.5 oz.
- 64K Complete with Wand & Voice - \$759
- 64K unit with Integrated Laser - \$1299



2-Way Radio Reader



- Scan and Key Data On-line with Portable Wireless Reader
- Computer Sends Display and Voice Messages
- 1,000 Ft. Range from Base
- Bar Code Input by Wand, Laser or CCD
- 6.3" x 3.3" x 1.25", 14 oz.
- Base Station - \$845
- Complete Terminal with Wand Scanner - \$1215
- With Integrated Laser Scanner - \$1790

We're not Just a Dealer!

WE'RE THE MANUFACTURER, SO YOU GET:

- Better pre-sale Advice on a Full Selection of Solutions
- of Simple wedge to Portable Batch to RF Wireless plus Bar Code Software
- Better post-sale Support
- 24 hour Turnaround on Repairs

Ordering is Easy!

1-800-345-4220

- Made in the USA ■ "800" Tech Support ■ 30 Day \$ Back Guarantee
- Qualified P.O's Accepted ■ 2 Year Warranty on Readers
- Same Day Shipping
- Free UPS Blue in US
- Direct from the Manufacturer

WORTHINGTON
DATA SOLUTIONS

CALL FOR FREE
CATALOG AND
BAR CODE
PRIMER!

Europe Phone: (353) 1 6614 566 • Fax: (353) 1 6614 622 • USA Phone: 408-458-9308 • Fax: 408-458-9364 • Web: www.barcodehq.com

All Your Bar Code Needs



- Best Prices
- Volume Discounts
- Your Own Free Technical Consultant
- Toll Free Technical Support
- Same Day Shipping
- 30-Day No Hassle Money Back Guarantee

Free 100 Page Catalog

www.systemid.com
800-397-9783
972-516-1100

SYSTEM ID

OR CALL 875 ON READER SERVICE CARD

MARKETPLACE READERS ARE BUYERS. 53%

OF THEM BOUGHT
HARDWARE FROM
A MARKETPLACE
AD IN THE LAST
12 MONTHS.

ADVERTISE HERE,
WHERE BRAND
SPECIFIERS BUY
DIRECT! CALL
800-825-4237
TODAY!

Source: Datacube Marketing Solutions Study

**THE BEST
PLACE ON THE
WEB TO SHOP
FOR ANYTHING
COMPUTER
RELATED JUST
GOT BETTER!**

<http://www.marketplace.zdnet.com>

Net Marketplace

Do you know where your
INVENTORY IS???



Bar Code Scanners
Cash Drawers
Receipt Printers
Thermal Printers

"Providing Point of Sale Inventory
Solutions for over Twenty Years!"
Inventory control for Wholesale,
Retail, Supply Rooms, Offices

Freeman Software
Garland, Tx.
Sales 800-426-6598
Fax 972-271-3808

<http://www.eden.com/~freeman>

Mouse Pads



Custom
Printed

• Your Logo
Design

• Fast
Turnaround

• Guaranteed
Quality

MicroStore™
800-962-8885

FAX: 507-
665-2604

LE SUEUR,
MN 56058

**Wrist
Supports**

CIRCLE 676 ON READER SERVICE CARD

Computer Solutions

- APC Power Protection Equipment
- Toshiba notebook computers
- Cisco Networking Gear
- Compaq Servers
- HP Printers

Please visit our website:
<http://www.msei.com>

for

state of the art technology at
down to earth prices

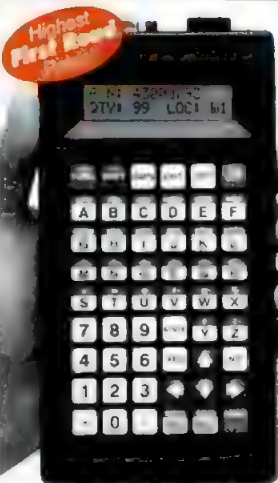
Please call (800) 535-5454
for a quick, competitive
price quote.

e-mail : sales@msei.com
M. S. Enterprises, Inc.

FAX: (508) 537-1326

© WWW. OR CIRCLE 677 ON READER SERVICE CARD

Special Dealer/VAR Discounts Available!



Portable Readers

- Operates on one 9-volt battery
- 54-key alpha/numeric keyboard
- Date and time stamps
- Auto power off with resume
- Incorporates American Microsystems' industry-leading decoding algorithm

Wand Packages

- Including decoder & cables
- Rugged construction
- Lowest cost input device
- Extremely high first read rates

**30-day No Risk
Guarantee!**

Laser Packages

- Including decoder & cables
- Extremely fast and accurate
- Ergonomically designed
- Very rugged and durable
- Even reads poorly printed bar codes



The
**Power to
be Efficient.**



CCD Packages

- Including decoder & cables
- Very fast and accurate
- No moving parts to break
- Completely solid state
- Ergonomic design
- Very rugged and durable
- Less expensive than lasers

**Lifetime Toll-Free
SUPPORT!**

Mag Stripe Packages

- Includes decoder & cables



**CALL NOW FOR A
FREE CATALOG!**

AMERICAN
MICROSYSTEMS, LTD

phone 817 571 9015 • fax 817 685 6232
2190 Regal Parkway • Euless, Texas 76040

800 648 4452 WWW.AMLTD.COM

13 years in business • 30-Day money back guarantee • Same-day shipping

CLASSIFIED

Marketplace

© 1997 American Microsystems, Ltd.

Hundreds of Barcode Products & Great Customer Service!

Barcode
DISCOUNT
WAREHOUSE, INC.Will Beat Any
Advertised Prices for
Comparable MerchandiseStar SP212FC/FD
Receipt Printer

\$235

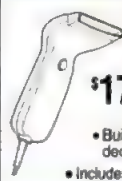
Cash Drawer
and Receipt
Printer Combo
AvailableMetrologic 951/47
Laser Scanner

\$269

5+ Units.....
\$259• With built-in
decoder
• Includes AT &
PS/2 cables

CCD Scanner

\$175

• Built-in
decoder
• Includes AT
or PS/2 cablePSC Quickscan 6000
Metrologic MS8720/47
Percon PT2000/128K\$395
\$895
\$595EZBarcode SerialWand
MMF ECD200 Cash Drawer
Star SP312FC/FD\$149
\$180
\$445

Call for a FREE Catalog! 1-800-888-2239



Phone: (216) 582-1144 • Fax: (216) 582-1177

e-mail: bcdw@coil.com • Internet: www.bcdw.com

9841 York Alpha Dr.-Unit C, North Royalton, OH 44133

CIRCLE 578 ON READER SERVICE CARD

Don't buy any
accounting software
before you see
our program!

- Order Processing
- Inventory Control
- Point of Sale
- Accounts Receivable
- Accounts Payable
- Shipping Labels
- Payroll
- Bank Reconciliation
- Profit Analysis
- Credit Card Processing
- Transaction Security
- XBase Compatible
- On-line Help
- Check Printing

**STORM+S.O. Fully Integrated
Management & Accounting system**

- General Ledger
- UPS Manifest
- Serial # Tracking
- Service Invoicing
- Purchase Order
- Multiple
- RMAs
- Back Orders
- Barcode Printing
- Barcode Reading
- Multi-Tier Sales Tax
- E-Mail Chat
- Contact Management
- Appointment Calendar
- To-Do List
- Mailing List

770.447.6257

www.bstorm.com

Storm Software Inc.

Norcross, GA 30071

CIRCLE 581 ON READER SERVICE CARD

When you're serious about
Order Entry
Get Serious With**MailOrderManager**

THE BUSINESS INFORMATION SOLUTION FOR SMALL BUSINESS

If you're a cataloger, retailer, wholesaler, distributor—anyone selling products or services by phone, mail, or even the World Wide Web—get complete control of your business with M.O.M. With M.O.M. you only need one program on your PC or PC Network to run your entire business—order entry, credit card processing, inventory, purchasing, contact management, shipping, mailing list management, accounting and reporting.

1-800-858-3666

http://www.MailOrderCentral.com

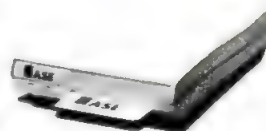
DydaComp Development Corp.

150 River Road, Suite N-1 Montville, NJ 07045

CIRCLE 582 ON READER SERVICE CARD

Gain Access To The World Of Smart Cards

Want to develop PC-based smart card applications? **ASE® - The Aladdin Smartcard Environment** is the solution you need! ASE is a complete package containing ASEDrive, a versatile read/write drive; ASESoft interfaces, utilities and samples; and ASECard memory and CPU cards. ASE's strengths include ease-of-use, flexibility and security! ASE is ideal for developing a range of applications, including electronic commerce, access control, authentication and more. **Make the most of this exciting technology. Order your low-cost ASE Developer's Kit today!**



1-800-562-2543

www.aks.com

ALADDIN
KNOWLEDGE SYSTEMS INC

Aladdin Knowledge Systems Inc.

Tel: 800 562-2543, 847 808-0300

Fax: 847 808-0313

Email: ase.sales@us.aks.com

© Aladdin Knowledge Systems, Inc. 1997. All rights reserved. ASE is a registered trademark of Aladdin Knowledge Systems, Inc.

CIRCLE 579 ON READER SERVICE CARD

DVD MPEG

1-888-dvdmpeg (383-6734)

www.dvdmpeg.com

• VCD & DVD TITLES FROM \$15.88

• 2-4 FREE CDS WITH DVD PLAYERS

• DVD UPGRADE KITS • MPEG CARDS

• SVGA + TV TUNER COMBO CARDS

• PC TO TV CONVERTER • TV TUNERS

9430 Warner #M Fountain Valley, CA 92708

Call 714 378 3167 Fax 714 378 3171

CIRCLE 583 ON READER SERVICE CARD

MICR \$99 Check Software

- Windows 95/3X
- Unlimited bank & company accounts
- **FREE** 30 day trial – download from <http://printerm.com>
- MICR Tester, Toner, Check Security Bond Paper

**PRINTERM
DataScribe, Inc.**

300 Pearl St., Buffalo, NY 14202

716-842-3099

Fax 716-842-6049

CIRCLE 584 ON READER SERVICE CARD

Sentinel is the #1 Solution to Piracy

Piracy is the greatest threat to the success of your software business. Today, the Internet and CD-ROMs make your software more vulnerable to piracy than ever before.

Stop piracy and ensure your revenue with Sentinel, the world's leading protection. Over 25,000 developers have relied on more than 11 million Sentinels to protect their software.

Call one of our security specialists today to order a *Sentinel Developers Kit* and receive your FREE guide: *How to stop piracy and increase your software sales.*

800-705-5552

www.rainbow.com/dkit

**SENTINEL**
Software Protection
The #1 solution to piracy

TEL: (714) 450-7300 • FAX: (714) 450-7450 • EMAIL: sentinel@rainbow.com • FRANCE: (33) 1 41 43 29 00 • GERMANY: (49) 89 32 17 98 0 • U.K.: (44) 1932 579200

©1997 Rainbow Technologies, Inc. Sentinel is a registered trademark of Rainbow Technologies. Distributors located worldwide, call or visit our web site for a complete listing.

CIRCLE 580 ON READER SERVICE CARD

KEY-LOK™ Piracy Prevention

- ☐ 15 years effective prevention
 - ☐ Very easy to implement
 - ☐ Algorithmic response
 - ☐ Programmable memory
 - ☐ Remote update - Free
 - ☐ Counters & Lease Control
 - ☐ Multiproduct licensing
 - ☐ Network Support
 - ☐ DOS/WIN3.x/WIN95/WINNT
 - ☐ Tech support 7 by 24 (800)
 - ☐ \$14/1,000, \$16/10, \$20/2
- No setup fees

www.keylok.com

Also, Access Control Systems &
Disk Drive/System Locks

Microcomputer Applications

3167 E. Otero Circle
Littleton, CO 80122
(800-453-9565)

(303) 770-1917 FAX - (303) 770-1863

CIRCLE 585 ON READER SERVICE CARD

Home Study ACCREDITED B.S. DEGREE in Computer Science

Easy-to-study lessons in Multimedia, C, C++, Windows 95, Java, Visual Basic, Networks, Unix, Database Design, Software Design, & many more lead to the only home-study BSCS degree accredited by an agency recognized by the U.S. Department of Education.

Professional software & hardware provided at no extra charge. Programs in Computer & Electronics Engineering Technology as well. All accredited by the Distance Education and Training Council and VA approved. Our 47th year.

Free Catalog: 1 (800) 955-2527

GRANTHAM College of Engineering

Grantham College Rd., Slidell, LA 70469-5700

ADDRESS FOR SUCCESS

<http://www.aics.edu>



- Earn B.S. and M.S. in Computer Science
- DISTANCE EDUCATION
- Object oriented B.S. program
- New courses in Java, Networking, HTML, MIS
- Approved by more than 275 companies
- Follows ACM/IEEE guidelines

AMERICAN
INSTITUTE
COMPUTER
SCIENCES

ACCREDITED
MEMBER
World
Association
of Universities
and Colleges

Free catalogue
1-800-767-AICS or
<http://www.aics.edu>

CIRCLE 586 ON READER SERVICE CARD

CALLING CARDS

A Multi-Billion-Dollar Industry

More money will be made in value added long distance resale than any other single area in American business today!

Start Your Own Phone Company

Point 2 Point - PC Platforms

- 24 to 1200 Lines
- Rackmount PC's
- Calling Cards
- Dialogic SCSA
- Intl. Call-Back
- Windows NT

No-Interest Financing

Only \$10,000 down and \$995/mo.

Resale Cards

Cards From .13/Min.
PIN's From .12/Min
Great Intl. Call-Back Rates
Custom Cards and Promotions

Call today to receive a FREE calling card and our informative book: How To Cash In On The Calling Card Industry!

RCP COMMUNICATIONS FX 602 734 8809

800-845-2716

www.debit-cards.com

CIRCLE 589 ON READER SERVICE CARD

Serious Software Licensing and Copy Protection without Hardware Keys or Disk Keys

Our protection actually adds features to your software without the cost and aggravation of hardware keys.

- ✓ Prevents unauthorized use & duplication
- ✓ Completely secure from all diskcopy systems
- ✓ Great for Internet & CD-ROM distribution!
- ✓ Not fooled by back-dating or re-installation
- ✓ Intelligent, reliable, cost-effective, easy to integrate and even easier to support

As CrypKey Instant, protects EXEs or data in 5 minutes, no coding! Foreign Languages!
NEW: CrypKey for EXCEL spreadsheets!

- ✓ Complete flexibility in licensing, including use by runs, time, enable or add options by phone/fax or e-mail
- ✓ Ready-To-Try feature lets your customers run for one limited trial period
- ✓ Supports DOS, Win3.x, Win 32s, Win95, Win95B(FAT-32), Win NT, OS/2 & intelligently manages network licensing on all Novell & Microsoft based networks.



**100% Satisfaction
Guaranteed!**

"The best combination of features, security, reliability, ease of use and price!"

Try CrypKey Instant FREE for 30 days: <http://www.kenonic.com/crypkey.htm>

Kenonic Controls Ltd., Calgary, Canada, Ph: 403-258-6200, Fax: 403-258-6201, e-mail: crypkey@kenonic.com

CIRCLE 590 ON READER SERVICE CARD



Win95+NT, DOS, MAC
Novell, OS/2

- FLAT RATE
- NO EVALUATION FEE
- 18 YEARS EXPERIENCE
- 24 HR. SERVICE AVAILABLE
- CALL US LAST!

800-339-3412

CIRCLE 590 ON READER SERVICE CARD

REMOVE HARDWARE LOCKS

IT'S LEGAL
AND EASY TO DO!

Using our RIVALOCK Software

CALL FOR DETAILS!

IMAGINE THAT

2730-Q US 1 South
St. Augustine, FL 32086
904-797-6600/L.O.C.K. fax

CIRCLE 597 ON READER SERVICE CARD

The Data Recovery Experts.

Over 40,000 successful
data recoveries performed.

When it comes to recovering your
critical data, bigger is better.

Experts on every operating
system and storage media.

Expansive data recovery
clean rooms worldwide.

- Data recovered 24 hours a day, every day
- Emergency & on-site services available
- FREE Data Recovery Consultation

Ontrack.
DATA RECOVERY

El Paso • LA • OC • Carson • T. J. • Stuttgart

800-872-2599

www.ontrack.com

CIRCLE 598 ON READER SERVICE CARD

MICRO.COM

DATA RECOVERY SPECIALISTS.

When you Absolutely, Positively have to get your Data back... call Micro Com now for a free consultation.

800 469-2549

www.mcrecovery.com

818/881-7417 • 818/881-8015 Fax

CIRCLE 581 ON READER SERVICE CARD



DATA RECOVERY

Lost your data? Don't panic CALL!

800-886-2231

Free evaluation!

- ✓ 24-hour
- ✓ priority
- ✓ weekend
- ✓ on-site

Services include:
 • DOS
 • Windows 3.11
 • Mac
 • Novell
 • Unix
 • OS/2

Also:
 • Backup / archiving systems
 • Competitive prices
 • Clean-room facilities

visit our Web site
www.data-recovery.com

DATA MECHANIX 18271 McDermott, Suite B, Irvine CA 92714
 telephone: 714-263-0994 facsimile: 714-263-1549

www. OR CIRCLE 592 ON READER SERVICE CARD

DATA RECOVERY

By Nick Majors' DATA RECOVERY LABS

Why do so many corporations, service technicians, small businesses & computer professionals insist on using Nick Majors and his team of experts for all of their emergency recovery needs? SIMPLE - We are just BETTER at what we do than anyone else in the world!

Nick Majors' DATA RECOVERY LABS
 (TORONTO, CANADA / BUFFALO, NEW YORK)

The most technically successful facility available - anywhere - at any price!

Specializing in HIGH-END / TOP PRIORITY JOBS - including
 Network Servers, Advanced Operating System problems,
 Multi-drive RAID/ARRAY configurations, Optical Jukeboxes
 and Tape / DAT recoveries

1.800.563.1167 **www.datarec.com**

www. OR CIRCLE 593 ON READER SERVICE CARD

DATA CONVERSION

Tape • Disk • CDR • 4/8mm
 Jaz • Zip • Cartridge • Modem
 Multiple Operating Systems
 Mainframe ↔ PC Data Experts
 In a Rush? No Problem!

PROCESSING

Data Entry
 Offshore option for large jobs
 Mailing Services - including
 Barcoding & Presorting
 1099/W2/1098/1042S
 Printing - Mailing - Filing
 Superior SERVICE since 1970

800.533.4443
CHAIKEN SYSTEMS
 370 7th Ave. New York NY 10001

CIRCLE 594 ON READER SERVICE CARD

CONVERSIONS DUPLICATIONS

TAPE 9-Track • 3480/90/90E •
 DLT • QIC • 8mm • 4mm
 DISK CD-R • 8" • 5¼" • 3½" • 3"

Convert DP records/fields
 Convert legacy WP
 IN A HURRY? data via FTP site or BBS

800-357-6250

PHONE: 317-842-2077 EXT. 300
 FAX: 317-842-8294
 WEB: <http://www.shaffstall.com>
 E-MAIL: support@shaffstall.com

Services & Systems Sales
 Since 1973 **SHAFFSTALL CORPORATION**
 7901 East 88th Street
 Indianapolis IN 46256

www. OR CIRCLE 595 ON READER SERVICE CARD

DATA CONVERSION

DISKS • TAPES • CARTRIDGES
 CONVERSION • DUPLICATION • SCANNING
 MORE FORMATS THAN ANYONE!

Quick • Reliable • Quality
 WORD PROCESSORS, MINIS
 MICROS, SPREADSHEETS
 DATABASES, MAIL LISTS

IBM, DEC, APPLE, WANG
 HP, WordPerfect, MS-Word
 Lotus
 Dbase
 MICOM
 LANIER
 CPT, NBI

3480/3490, DC2120
 8/4MM, XEROX, CP/M, UNIX ...

NATIONAL DATA CONVERSION
 5 East 16th Street, New York, NY 10003
(212) 463-7511
 AMERICA'S LEADERS IN DATA CONVERSION

CIRCLE 596 ON READER SERVICE CARD

DATA RECOVERY SPECIALISTS

- ESTABLISHED 1980
- GOV'T CERTIFIED
- NO EVAL CHARGE
- FAST TURNAROUND
- DOS, NOVELL, WIN95, NT, OS/2, MAC, SUN....



INDEPENDENT TECHNOLOGY SERVICE

800-342-3475
 805-526-1555 fax 526-2590
www-i-t-s.com

www. OR CIRCLE 597 ON READER SERVICE CARD

DATA CONVERSION

If you want the most complete conversion services in the industry, just call...



(800) CONVERT

Capabilities include over 6000 formats
 Data Recovery Services Available

PIVAR COMPUTING SERVICES, Inc.®
 165 Arlington Heights Rd. #M
 Buffalo Grove, IL 60089
(847) 459-6010
www.pivar.com

CIRCLE 598 ON READER SERVICE CARD

DATA RECOVERY IN HOURS

- Over 10 years of experience with clients worldwide (HP, NASA, & FedEx).
- We've recovered more than half-a-million megabytes of lost data.
- You only pay if there's a recovery.
- Call 24-hours a day.



LAZARUS
 DATA RECOVERY
 Working at the speed of business.

800-341-DATA
 415 495-5556 • FAX 415 495-5553 • RESTRICTIONS MAY APPLY
 381 Clementina Street • San Francisco, California 94103

CIRCLE 599 ON READER SERVICE CARD

SPIN PUT YOUR BUSINESS ON THE WEB

WEB HOSTING

\$19.95 Per Month

- Unlimited E-mail Forwarding
- Domain Name Registration available (www.your-company.com)
- 1000 MB of Data Transfer per Month
- 50 MB Storage for HTML Documents and Graphics
- Full Redundant T3 Connection to the Internet
- Tons of Web Tools and Wizards
- Real Time Reporting on Web Site Activity
- Support for Custom CGI Scripts
- Reseller's Welcome

SLIP.NET

1-800-255-3142
www.slip.net
Order Online!

CIRCLE 600 ON READER SERVICE CARD

CD-ROM DUPLICATION

- Same Day CD-R Duplication Labeling, and Insert Printing
- Extensive Premastering any format from any source
- Quick Turn CD-ROM Replication
- Turnkey Production of CD/CD-R Art/Film/Printing Services

DISC PRESS

for your FREE Guide to CD ROM Production visit our website!

www.discpress.com

or call 888-311-DISC (3472)
203 759 0574 • Fax 203 759 0553

CIRCLE 601 ON READER SERVICE CARD

Affordable DISKETTE & CD-ROM Duplicating Equipment

MAKE YOUR OWN COPIES

- Simple to Use.
- Super Reliable.
- A Snap to Set Up.
- Easily Pays for Itself.
- Free Media With Your Equipment Purchase.

BULK DISKS/CD-R'S
Verbatim • Dysan • TDK

DISKS: 3.5 LD or HD	Qty:	250+	1000+
Blank		.31	.27
Formatted		.37	.33

CD-R's: 74 Min	50+	200+	500+
House Brand	4.99	3.99	3.49
TDK	5.29	4.29	3.69

WE CAN ALSO DUPLICATE CD'S AND DISKETTES FOR YOU
24 hour turnaround Custom labels & packaging. Highest quality media. Total Quality Assurance.

800-426-0247
Fax (908) 892-6186
PRINCETON DISKETTE
www.princetondiskette.com

1101 Richmond Ave., Pt. Pleasant Beach, NJ 08742

CIRCLE 603 ON READER SERVICE CARD

DISKETTE DUPLICATION

HIGHEST QUALITY MEDIA

- 3.5" and 5.25" Formats
- Custom Labels/Shutter Printing
- Diskette Mailers/Accessories
- Assembly Services
- Bulk and Formatted Diskettes
- Generous Volume Discounts

CD ROM Duplication

- Pre-Mastering Services
- One-off/Small Volume Runs
- Large Volume Replication
- Blank CD-R media 74 minute
- Three color CD-R silk screening

800-255-3142
Diversified Systems Group, Inc.
P.O. Box 1114
Issaquah WA 98027

CIRCLE 604 ON READER SERVICE CARD

Zowie!!

all straight A's?

You can Ace the CD-R game too with a little help from AMC and:

Mitsui Gold recordable CD-Rom media.

- ✓ Absolutely the Best CD-R's in the world and backed by the only lifetime warranty in the business.
- ✓ Affordable 10-disc sample pack available for only \$29.99.
- ✓ All you'll need to burn your own CD-Roms and all from one place. Call AMC today at 1-888-558-3117 and be sure to mention ad code PCM10C2 when ordering.

AMC Complete Multimedia Solutions.

ADVANCED MULTIMEDIA CONCEPTS
P.O. Box 3456 Redmond, WA 98073-3456
888-558-3117 www.pcm.amc-Direct.com

CIRCLE 605 ON READER SERVICE CARD

A DUPLICATOR OFFER THIS TERRIFIC MAY NEVER BE REPLICATED.

Thinking about investing in duplication equipment? Let us help you determine the best solution. State-of-the-art CD and Disk Duplicators at unbelievable prices.

Call 800 MEGASOFT (634-2763) ext. 395 today!
Or visit megasoftware.com/equip.html

MEGASOFT

Ask about our CD/disk duplication and media services.

CIRCLE 606 ON READER SERVICE CARD

JetMaster

Re-Usable Ink Jet Refill System

Lowest cost per recharge in the world. Buy lot, later just buy additional ink, which is available in 2 oz., pint, and gallon size. Costs as low as \$1 per recharge. Waterproof inks available. Most Inkjet printers supported.

BJ615S Inkjet (Canon BubbleJet)	\$29.95
IM6 (HP 500 Series)	\$9.95
IM6-MC1 (HP 500 Series Black/Color)	\$69.95
IM6-MC1-600 (HP 600 Series Black/Color)	\$69.95
BJ6-MC1-600 (Canon BJ-600)	\$49.95
BJ6-MC1-2440 (Canon 4000-4100)	\$49.95
Black Jet Ink (2 oz.)	\$10.50
Color Jet Ink (2 oz.)	\$11.50

Order toll free 1-800-547-3303

Computer Friends, Inc.
<http://www.teleport.com/~cfriends/>
E-Mail: cfriends@teleport.com
Tel. (503) 626-2291 Fax (503) 643-5379

CIRCLE 607 ON READER SERVICE CARD

no surprises

When it's got to be right the first time, count on MEGASOFT. From reliable diskette and CD-ROM duplication, packaging and fulfillment to MEGASOFT Web Transporter™, the fast, powerful way to distribute software and documents over intranets and the Internet. ISO 9002 certified QMS.

FREE CD/disk Project Planning Guides! Call 1-800-MEGASOFT (634-2763) today. Or visit us at www.megasoft.com.

819 Highway 33 East, Freehold, NJ 07728

MEGASOFT

CIRCLE 608 ON READER SERVICE CARD

AUTOMATIC DUPLICATION EQUIPMENT

• CD-R
 • Diskettes
 • HSE
 • PCMCIA

Floppy & CD-R
Printers, too!

Floppy Standalones
from \$1695
 CD R Standalones
from \$5495

**OVER
13,000 UNITS
INSTALLED
WORLDWIDE!**

888-723-3475
 510-373-6060
CHAMPION championsms.com

CIRCLE 609 ON READER SERVICE CARD

DISKETTE DUPLICATION CD ROM REPLICATION PRINTING & PACKAGING WAREHOUSING DISTRIBUTION

 **Floppy Copy**
 INCORPORATED
 Integrated Software Services

3822 WEST 1987 SOUTH • SALT LAKE CITY, UTAH 84104
 801-975-9411 • FAX 801-975-9394 • 1-800-732-3475

CIRCLE 610 ON READER SERVICE CARD

GUARANTEED SUCCESS!

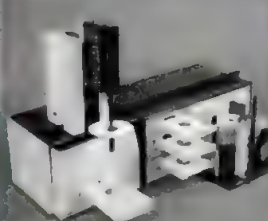
- ◆ Earn \$500 TO \$2000 per week!
- ◆ Guaranteed Profits in Writing!
- ◆ LOW Start-up
- ◆ Not Multi-Level
- ◆ Full or Part Time
- ◆ Limited Offer!!
- ◆ CALL NOW!!

 **(800) 341-7868**
 inet INTERNATIONAL

www.inet.com OR CIRCLE 611 ON READER SERVICE CARD

Unbelievable !!!

- ▲ CD-R Duplexer LOADED \$1,995
- ▲ + "Signature" CD Color Printer \$1,295
- ▲ Upgrade to FULLY AUTOMATED \$2,995



Modular Expandable, Standalones
1-888-276-7932
 Fax 510-417-2903
<http://www.costas-systems.com>
 email: costasys@ix.netcom.com

www.costas-systems.com OR CIRCLE 612 ON READER SERVICE CARD

Design, Print and Apply CD Labels for \$79⁹⁵

That's NEATO!

- 1 Create your own artwork On Your Computer with NEATO Templates.
- 2 Print on Any Laser or InkJet using NEATO pressure sensitive labels
- 3 Using the NEATO Label Device, apply labels. PERFECTLY EVERY TIME!



NEATO LLC 250 Dodge Ave • East Haven, CT 06512
 800-984-9800 • 203-466-5170 • Fax 203-466-5178
 Email: sales@neato.com • Fax: 44 (0)181 932 0480
 Service at: <http://www.neato.com>

VISA / MC / AMEX
 INKING PRODUCT OF THE YEAR '98

CIRCLE 613 ON READER SERVICE CARD

CD & DISKETTE DUPLICATION

- Quality Disk & CD Duping, low prices, fast turnaround
- Labels for CD & Diskette, Color printing on CDs
- CD & Diskette fulfillment. Let us send out your demo for you
- Great prices on quality, high-clip media, call for current pricing

 **DUPLEX K INC.**
 Quality...Everytime.
 PO Box 9, Wellington, MO 64097
888-899-3475
 816-934-8518 FAX 816-934-2590

CIRCLE 614 ON READER SERVICE CARD

RAPID REPRODUCTION

SIMPLE-FAST-SMART- RELIABLE
MANUAL DISKETTE DUPLICATORS
AX \$1,695 AS SHOWN



AX 1000-2000 SERIES
 • FORMATS, COPIES, VERIFIES
 • 360-5.25"/HR. - 180-3.5"/HR
 • COPIES ALL MFM FORMATS
 • RELIABLE TEAC DRIVES
 • AVG. 100,000 COPIES/DRIVE
 • STAND ALONE OPERATION
 • 1 YEAR WARRANTY
 • AUTOLOADERS AT \$2,195

AXIOMATIC
 TECHNOLOGIES CORPORATION
 4995 Timberlea Blvd. Mississauga
 Ontario, Canada, L4W 2S2
 (905)602 9270 Fax: (905) 602 9279

CIRCLE 615 ON READER SERVICE CARD

CopyPro

CD & Disk Duplicators

CD-R 3500
 Auto-Duplicator
 50 at a time!



Standalone & PC-connect
 from \$6495

Hi-capacity
 450 CD Duplicators Available!

Automatic floppy Duplicators
 from \$1295!!!

Tel: 510-680-1200 Fax: 510-680-1263
 Email: sales@copypro.com
www.copypro.com
1-800-887-9906

CIRCLE 616 ON READER SERVICE CARD

The Fastest Turnaround! ★ ★ ★ High Quality Media!

DISKETTE DUPLICATION

Count on our Reliable, Worry-Free Service!

SOFTWARE PACKAGING SUPPLIES & FULFILLMENT

Printed Sleeves, Labels, Vinyl Pages, Markers, Licence Agreements, Shrink Wrapping, Marling, etc.

CD-ROM MASTERING & DUPLICATION

One-off CD, Small and Large Volume duplication and Packaging

MEDIA CONVERSIONS

2500 Word Processing Formats, Disks, 9-Tracks, 480, Colorado, QIC 80, 8mm, 4mm DAI, TK50, OCR Scanning

BLANK DISKS/CD-ROM's

Will beat any advertised price!

COMPANY COMPENDIA Inc.
1-800-374-DISK
 Ph: 312-419-8771 Fax: 312-419-1390

CIRCLE 617 ON READER SERVICE CARD

THE BEST PLACE ON THE WEB TO SHOP FOR ANYTHING COMPUTER RELATED JUST GOT BETTER!

<http://www.marketplace.zdnet.com>


2 Live Amateur Lesbians

Live 2 on 1 Adult Videoteleconferencing on your PC...

Type or talk privately to 2 amateur lesbians at once while you watch them tease and please each other on your command.

For a free disk, call
1-800-958-6770

www.2livelesbians.com
BBS 203-596-2496

Must be 18+ 

CIRCLE 618 ON READER SERVICE CARD

Hardcore Underground Sex Sites

- STRANGE RARE PICS
- Updated Daily!
- 40+ CATEGORIES

including:

- AMATEURS • BIZARRE • BONDAGE •
- BUSTY • CHEERLEADERS • HARD CORE •
- PUBLIC NUDITY • TS/TY • YOUNG GIRLS •

Plus Many More!

www.sexxsites.com

LIVE SEX SHOW!

Live Girls-24 Hours

1-800-617-6699

Adults Only!

CIRCLE 619 ON READER SERVICE CARD

BABYLON X

RARE COLLECTORS PICK!
100% GENUINE
HARD CORE BEDROOM POLAROID
SNEAKY PAPARAZZI HOT-SHOTS!

- MARIONNA HARD CORE SHOT!
- PRINCESS DIANA DARES ALL!
- PAMELA ANDERSON'S WEDDING VIDEO!
- ADRIAN SCHALL'S PINK CLAY!
- CHRY CHAMBER!
- BARBARA STEPHAN!

Don't miss out - get in NOW!
While they're still there!

School Girl Strip

LIVE IN YOUR BROWSER!

24 Hours a Day, 7 Days a Week

www.babylon-x.com

ADULTS ONLY - MUST BE 21 YEARS OR OLDER

CIRCLE 620 ON READER SERVICE CARD

CLUB  ACME LLC PRESENTS
CLUB TAJ MAHAL
"GIRLS"
Live Video Conferencing
Here's your chance to enjoy the beautiful
Taj Mahal Entertainers
Privately One on One
100% Live Totally Adult Entertainment
Video Conferencing
Featured in: Rolling Stone, New York Times, CNN, NBC Real Life, Xtra
Call Toll Free 1-888-256-5535
Internet: <http://www.clubtajmahal.com>
<http://www.clubtajmahal.com>

CIRCLE 621 ON READER SERVICE CARD

MARKETPLACE READERS ARE BUYERS. 53% OF THEM BOUGHT HARDWARE FROM A MARKETPLACE AD IN THE LAST 12 MONTHS.

ADVERTISE HERE, WHERE BRAND SPECIFIERS BUY DIRECT! CALL 800-825-4237 TODAY!

Source: 1996 PC Magazine Marketplace Subscriber Study

LIVE Interactive VIDEO CONFERENCING

99% min.

Love is Hot
24 hrs. • FREE join & software
FREE Chat direct with our HOT babes
www.loveishot.com

CIRCLE 622 ON READER SERVICE CARD

HOT PEEP SHOW

24HRS/DAY • LIVE!
DIRECTLY FROM AMSTERDAM

- Peep at 100 different gorgeous girls and couples enjoying themselves.
- Interact with them.

The most striking shows you've ever seen

WWW.HOTPEEP.COM

BIZARRE

FOR SM, B&D, D.S., FETISH

- FROM AMSTERDAM, UNUSUAL, UNCENSURED HOT PICTURES.
- ONLINE VIDEOS THAT YOU HAVEN'T SEEN ANYWHERE BEFORE.
- MEET YOUR MATE IN THE FREE SWINGING AREA.

WWW.BIZAR.COM

adults only 18+

CIRCLE 623 ON READER SERVICE CARD

Lipstix Live Video Sex

Hot Young Florida Babes Are Waiting To Please You

Free 10 Minutes

Free One-On-One

Free 30 Minute Peepshow

FREE PICS

www.lipstixxx.com

Or For Free Disk
1-800-260-5124

Lesbian Shows Also Available

CIRCLE 624 ON READER SERVICE CARD

THESE ADS WORK!
61% OF THOSE WHO READ MARKETPLACE ADS BUY OFF THE PAGE.

ADVERTISE HERE, WHERE BRAND SPECIFIERS BUY DIRECT! CALL 800-825-4237 TODAY!

Source: 1996 PC Magazine Marketplace Subscriber Study

LIVE SHOWS lesbian & gay

sweethole.com

lesbian & gay

MUST BE 21 OR OLDER

LIVE SHOWS

ROCKY MOUNTAIN PLAYMATES
Live one on one Adult Videoteleconferencing on your PC
The hottest nude female Playmates at your command! Download our software and make your fantasies a reality tonight!
1-800-596-1133 X9222
Must be 21 or older
   

CIRCLE 625 ON READER SERVICE CARD

sexwell.com

LIVE GIRLS
NO DOWNLOADS
PICTURE GALLERY
1000'S UPDATES
ADULT VIDEO CLIPS

ADULT MALL
KINKY PERSONALS
EROTIC CONFESSIONS
EROTIC CHAT ROOM
UNLIMITED MONTHLY ACCESS

must be adult 18 & over

CIRCLE 626 ON READER SERVICE CARD

PC Magazine's BusinessCard section is a forum for innovative, hard-to-find and low-cost PC products and services. Ads are listed by product category and include Reader Service numbers to allow fast, easy response.

RATES:

1 issue—\$1070, 3 issues—\$935, 6 issues—\$905, 12 issues—\$860, 17 issues—\$810, 22 issues—\$800
Multiple-ad per issue rates also available.
Prepayment must accompany each insertion. VISA/MC welcomed.

AD FORMAT:

PC Magazine will typeset each BusinessCard ad. Advertisers should furnish typewritten copy. Ads include: 1) Headline (1 line, initial caps=30 characters max, all caps=25 characters max), 2) Descriptive copy (5 lines, 225 characters max), 3) Company name (same specifications as headline), and 4) Address and telephone number (2 lines, 40 characters per line). No logos, art-work or camera-ready ads. Publisher reserves the right to edit supplied copy to meet section specifications.

DEADLINES:

PC Magazine is published 22 times a year, (bimonthly except for July and August). The BusinessCard closing is approximately two months prior to issue date.

Please send copy and payment to:
PC Magazine BusinessCard
One Park Avenue, 3rd Floor
New York, NY 10016

For more information, call 800-825-4237 or 212-503-5115, FAX: 212-503-5860.

HARDWARE/BATTERIES

Batteries/Tools for Mobile Professionals

Do your "2-HR" batteries only last 15 min? Try our long-life batteries, ac adaptors, car cords & chargers for Laptop, Cellular, Camcorder. Largest selection in the country! 1 Yr. Wmty. Low prices. Call 800-228-8374 for FREE battery guide/catalog.

1-800-Batteries

2301 Robb Drive, Reno, NV 89523
24hrs/7days • F702-746-6155 • www.800Batteries.com

CIRCLE 721 ON READER SERVICE CARD

STATISTICAL/RESEARCH

The Survey System for Windows

Analyzes: marketing, public opinion, customer satisfaction, employee attitude surveys. Handles mail, personal, phone, scanner, disk-by-mail, computer interviews. Records verbatim text/voice answers. Powerful, flexible, user friendly. Free support.

Creative Research Systems

140 Vista View #100, Petaluma, CA 94952-4728
Ph. (707) 765-1001/Fax (707) 765-1068
www.surveysystem.com

CIRCLE 724 ON READER SERVICE CARD

Hand Your Business Card...

To 1,175,000 of the most qualified buyers in the PC market. These brand-specifiers are looking to buy while reading the industry's #1 publication. There is no more cost-effective or efficient way for you to build sales.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

COMPUTER SYSTEMS

Custom Built Systems

- Custom built Pentium Desktop & Laptop Systems
- Wholesale pricing software

Creative Computer Consulting

5231 Santa Fe Drive, Suite 295
Littleton, CO 80120
(303) 795-9663 Fax (303) 730-1007
(800) 875-8452

CIRCLE 722 ON READER SERVICE CARD

SERVICES/COMPUTER INSURANCE

Insures Your Computer

The COMPUTEROWNERSSM insurance policy repairs or replaces hardware, media and purchased software. Rates as low as \$49 a year covers theft, fire, accidents, power surge and more! Call for immediate coverage or info. 1-800-800-1492.

Safeware, The Insurance Agency Inc.

5760 N. High Street P.O. Box 656
Columbus, OH. 43085

CIRCLE 727 ON READER SERVICE CARD

MULTIPLY—

Your sales by handing your business card to 1,175,000 buyers at one time in the place where they seek to buy—tell them about your product in PC Magazine Marketplace BusinessCard.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

SOFTWARE/DATA ENTRY

The Data Entry Emulator™

Full featured, heads-down data entry with two-pass verification, edit language, output record reformat, operator statistics, batch control, on-line help, free tech support, key from images (NEW!). For PC, PC LAN, S/36, or AS/400.

Computer Keyes

21929 Makah Road, Woodway, WA 98020
800-356-0203/206-776-6443/Fax: 206-776-7210

ONLINE SERVICES

DNEWS - Internet News/Forum Server

Provide the fastest access to Internet news. Provide local news/discussion groups - the new vehicle for internal communications. Download DNEWS NOW and experience performance.

NetWin Ltd

http://netwinsite.com
netwin@netwinsite.com

CIRCLE 728 ON READER SERVICE CARD

MARKETING POWER

Is yours when you place your message in this space. Reach 1,175,000 buyers of all kinds of PC products. Give your business card PC Magazine Marketplace Power.

BusinessCard

Call 1-800-825-4237 today.

MANUFACTURING/INVENTORY

MAINTENANCE MANAGEMENT

PC-based system for small/medium size business. FEATURES: Work Orders (space for detail instructions & safe work procedures), equipment descriptions, historical data, operating & analytical reports, inventory. Available for Windows & DOS.

PENGUIN COMPUTER CONSULTANTS

P.O. Box 20485, San Jose, CA 95160
(408) 997-7703 FAX: (408) 927-0570 (800) 521-0545
http://home.earthlink.net/~penguinmaint

CIRCLE 723 ON READER SERVICE CARD

Your Success Is In The Cards...

In the PC Magazine Marketplace BusinessCard pages. Advertise in every issue—pay less and increase impact.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237

We Make It So Easy—

Leave your business card with us and we'll do the rest. PC Magazine will create your BusinessCard for you. It's so easy—and so very effective.

BusinessCard

Call your BusinessCard representative today.
1-800-825-4237



Advertising Sales Staff

One Park Avenue
New York, NY 10016
212 503-5100

DISPLAY ADVERTISING

Nancy Newman - Publisher
(212) 503-4453
**Peter Longo - National Associate
Publisher**
(212) 503-3849
Vickie Pinsky - National Sales Director
(212) 503-5651
Ad Systems Manager

Julie Eigo
(212) 503-5107
Advertising Coordinator
Jennifer Kim
(212) 503-5037

**Kimberly Jackson - East Coast Ad
Director**
(617) 393-3055

MA, NH, VT, ME, RI, Canada

District Sales Manager
Cameron Brown (617) 393-3058
10 President's Landing, Mystic Center
Medford, MA 02155
Account Representative
Amy Farrell
(617) 393-3059

CT, NY, NJ, NC

District Sales Manager
Thomas Koletas (212) 503-3703
One Park Avenue, 4th Floor
New York, NY 10016
Account Representative
Beatrice Olivas (212) 503-5112

DE, MD, DC, VA, WV, SC, AL, MS, TN, AR,
KY, GA, FL, PA

District Sales Manager
Kevin Hein (212) 503-5176
One Park Avenue, 4th Floor
New York, NY 10016

Cameron Brown - Area Manager
(617) 393-3058

WI, IL, IN, MN, MI, IA, ND, SD, OH

District Sales Manager
Ed Beach (312) 214-7353
150 North Wacker Drive, 25th Floor
Chicago, IL 60606
Senior Account Representative
Katie Gillon
(212) 503-5011

TX, OK, LA, NM, CO, AZ, KS, NE, MO

District Sales Manager
R.J. Kirkland (214) 360-5725
5956 Sherry Lane, Suite 625
Dallas, TX 75225

**Mike Kisseberth - West Coast
Associate Publisher**
(415) 547-8809

CA (Los Angeles), HI, NV

District Sales Manager
Stephanie Sload (310) 268-1381
11766 Wilshire Blvd., Suite 1550
Los Angeles, CA 90025

CA (San Diego & Orange County)

District Sales Manager
Jeff Kamikow (714) 852-5920
18301 Von Karmen Avenue, Suite 330
Irvine, CA 92715

**Tim Castelli - West Coast Ad
Director** (415) 547-8810

CA (San Jose), CO, ID, AK

District Sales Manager
Jennifer Hillis (415) 547-8816
50 Beale Street, 13th Floor
San Francisco, CA 94105
Account Representative
Jennifer Duddy
(212) 503-5024

CA (San Francisco & North)
WA, BC, OR

District Sales Manager
Jordan Klineman (415) 547-8807
50 Beale Street, 13th Floor
San Francisco, CA 94105
Account Representative
Jason Ratner
(212) 503-5047

CA (South San Francisco to
Mountainview), UT, WY, MT

District Sales Manager
Jon Schwartz (415) 547-8813
50 Beale Street, 13th Floor
San Francisco, CA 94105
Account Representative
Brian Gleason
(212) 503-5161

CENTRAL ADVERTISING

VP, Central Advertising
Robert A. Bader

Director of Sales and Marketing
Ken Holmstrom

Sales Manager
Bill Herbst

Production Director
Vicki Egan

Sr. Production Coordinator
Rob Scott

Sr. Advertising Coordinator
Marilyn Aldir

ID, MT, NV, OR, UT, WA, WY, AK,
Canada

Account Representative
Rachel Levy
(212) 503-3626

AL, AR, FL, GA, LA, MS, NC, SC, TN, WV,
KY, DE, DC, IL, IN, MD, MI, VA, WI

Account Representative
Jackie O'Hare
(212) 503-5138

CA (213, 310, 619, 714, 805, 818, 909), HI

Account Representative
Janet Fu
(212) 503-5132

CT, ME, NH, RI, VT, MA, NJ, PA, NY, OH,
Foreign

Account Representative
Patricia Nunez
(212) 503-3620

CA (209, 408, 415, 510, 707, 916)

Account Manager
Lisa Weseley
(212) 503-5118

CO, IA, MO, NE, AZ, KS, MN, ND, OK, SD,
NM, TX

Account Representative
Andrea Sachs
(212) 503-4579

**Business Card
Advertising**
Call: 1-800-825-4237
PC Magazine Marketplace
One Park Avenue, 3rd Floor
New York, NY 10016

**For more information
regarding *display*
advertising please call:**
212 503-5100
1-800-33MAG AD

**For more information
regarding *central*
advertising please call:**
212 503-5115
1-800-825-4237

First

1988: The world's first CD recording system — enabling CD mastering in major music recording studios and one-off creation for CD-ROM software developers.

First

1990: The world's first 2X speed CD recording system — allowing for faster mastering of CD's.

First

1994: The world's first 4X record / 4X read CD-R drive in single half-height form factor — allowing high performance CD recording to be integrated into a standard desktop computer.

Some habits are hard to break.

First

1996: The world's first 4X record / 6X read CD-R drive — which included many additional features such as packet writing, 2 MB buffer, running OPC, and faster 6X read speeds — made CD creation as simple as recording to a floppy disk.

First

1997: The world's first high performance Multi-Function CD-RW drive (4X record, 2X rewritable, 6X read) for desktops. Records CD-R discs that can be played on any CD-ROM drive. Records CD-ReWritable (RW) discs for applications such as backup. Reads all CD-ROM, CD-R, and CD-RW discs.

YAMAHA®

Write it. Read it. Rewrite it again on the same disc. And do it all on the same Yamaha Multi-Function CD-RW drive

With each step forward, we've made the power of CD more available, more affordable, more personal. So that now, with our new Yamaha Multi-Function CD-RW drive you can record music, video, or just plain data. CD-R discs are backward compatible with the 200 million+ CD-ROM drives already in homes and offices worldwide. By the way, if you make a mistake or your data changes you can erase and rewrite on the same CD-RW disc. Your storage costs are ultra low-cost per megabyte

Ask your computer dealers or distributors about Yamaha's new Multi-Function CD-RW drive. Or visit our Web site for the one nearest you

www.yamahast.com

1-800-543-7457

CIRCLE 038 ON READER SERVICE CARD



After Hours

Dream Designs

One of these eight programs can best help you visualize your dream house.

For this year's roundup of 3-D home design software, we concentrated on ease of use. While most of the packages reviewed here offer powerful features, many fall short on usability.

With this in mind, we set out to find the one package that best combines full-feature 3-D design power with a straightforward interface. Other fea-

But if you need precision placement of objects, you'd do better with another package.

When you first begin using CustomHome 3D, you work in a 2-D drawing space. The interface is intuitive and livelier than in standard window applications.

You can begin a new project from scratch, use a wizard, browse existing house and

wall; most are unaware of one another, so aligning them in a pattern is difficult. On a positive note, you can enter a price for each object and generate reports to estimate the cost of your project.

Fortunately, the product's 3-D view hides most problems with misalignment. Though you cannot view 2-D and 3-D images simultaneously, you can easily switch between these environments.

Generally, the product meets the needs of the casual designer: It's easy to access features and to develop a 3-D image, and help is just a step away. With a little more attention to the object placement feature, this product would be even more impressive.—C. James Galley III

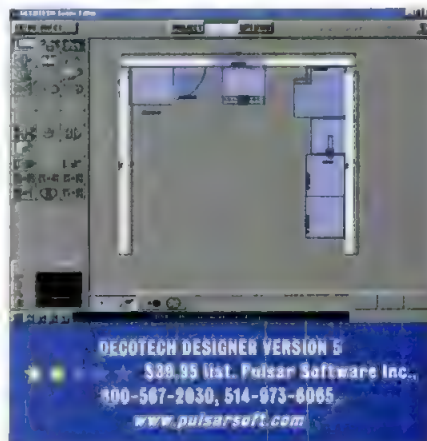
DecoTech Designer

Confusion set in as soon as we loaded DecoTech Designer, Version 5.

A dialog box prompts you to create a new project or select an existing one. Buttons at the top left read CE, PE, PM, and CI, and only after holding the control key and the right mouse button did we learn that they meant Cabinet Editor, Pattern Editor, Price Manager, and Cabinet Itemizer—and those last two features are available only in DecoTech Professional (\$695.95).

Three mode buttons at the top of the screen read Project, Options, and Edition (which we eventually determined was the button for edit mode). The full

toolbar at the left of the screen is perplexing, since the icons are



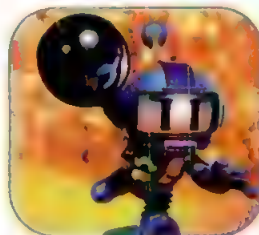
nearly indecipherable. The manual and online help are your only hope in determining how to use this program. Fortunately, a tutorial button details the Scene Editor and its functions and operations.

This program offers good 3-D rendering. You begin with a basic floor plan and add a wide variety of furnishings and appliances (3,000 are included). A snap feature ensures that objects are properly aligned

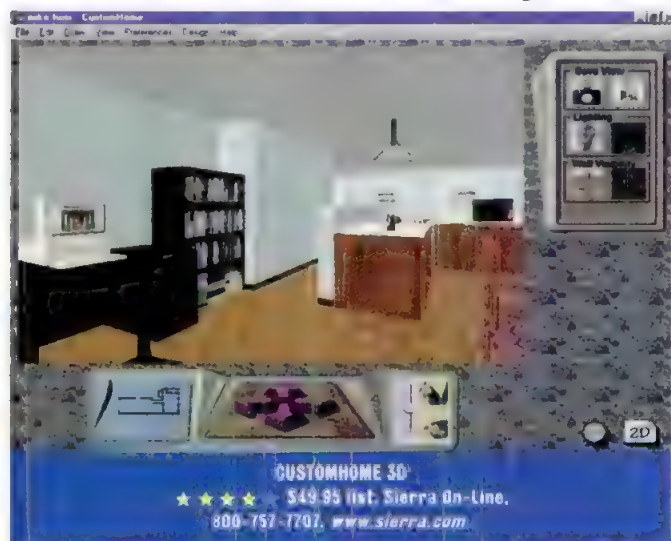
INSIDE

ISLAND HOPPING

Take command of the Japanese or American forces in Pacific General. See page 366.



BOOM! YOU'RE DEAD
An explosive console game comes to the PC. See page 366.



tures, such as cost estimation and support for .DXF file formats, counted for much during our review process.

When we considered all these factors, we selected Broderbund's 3D Home Architect as our Editors' Choice.

CustomHome 3D

Sierra On-Line's CustomHome 3D is easy to learn and use, and it generates clear and accurate 3-D views.

room plans, or review design ideas and get some advice from the program's useful, well-thought-out Design Center.

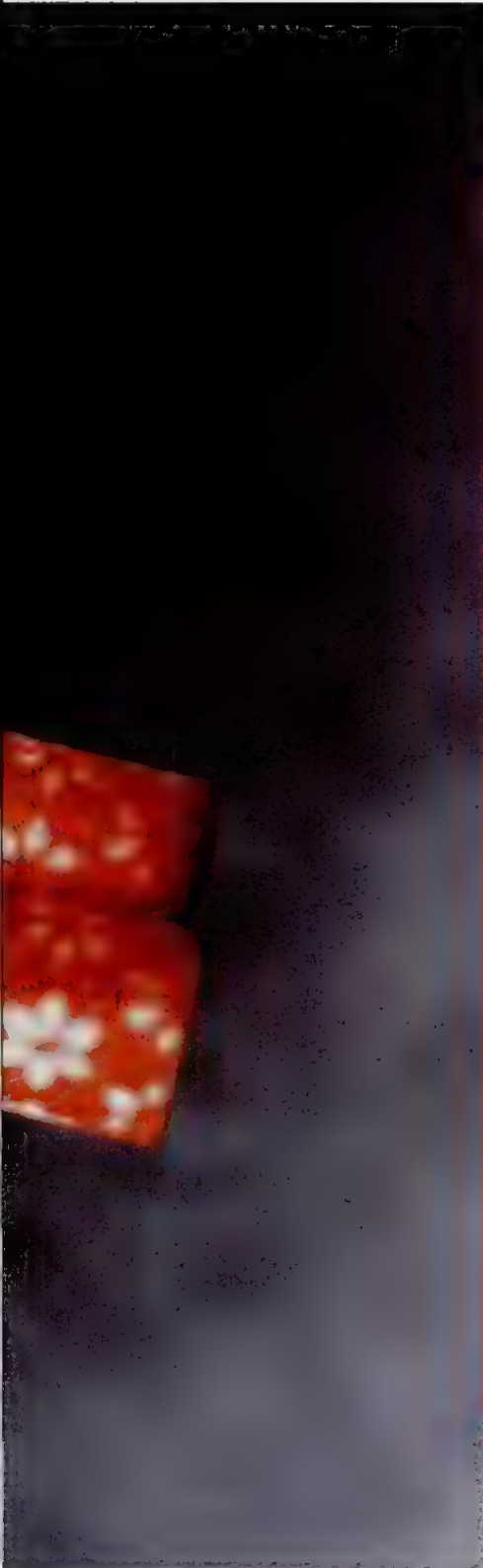
Equally impressive are the sample designs, which are categorized by size and style.

With so much going for CustomHome 3D, it's unfortunate that customizing your plan is not that easy. You can drag and drop objects onto the 2-D workspace easily enough, but these objects snap only to the

© 1997 Satec Lansing Technologies, Inc., Milford, PA 18337

A close-up photograph of a lit firecracker. The firecracker is red with a white starburst pattern and is tied with a piece of white twine. A bright orange flame is at the tip of the black fuse, and a large cloud of white sparks is erupting from the burning end. The background is a dark, textured grey.

**A soft sizzle is replaced very
suddenly by pure adrenaline.
That's True Digital Audio.**



Call 1-800-258-3288



Technology should never get
in the way of reality. It should
enable it. Not interpret it.
It should allow an event to be
heard the way it happened.
That's what True Digital Audio
does. By delivering a pure
stream of digital signals to the
speakers, audio degradation
is virtually eliminated. And
pure sound comes through.
It's called True Digital Audio
for a reason. And it's only
from Altec Lansing.

www.altecomm.com

TRUE DIGITAL AUDIO™

After Hours

with other, overlapping objects.

Once you learn to use the product's convoluted interface, you can discover plenty of options, including some impressive color and shading details.

Two lower-cost versions of the product are available: a \$39.95 version with 2,300 objects and a \$19.95 version with 1,800 objects and no manual.

DecoTech Designer has a lot to offer, but it is cryptic and will most likely prove to be too frustrating for users accustomed to friendlier interfaces.—*Brett Krasnov*

Expert Home Design 3D

A movie for two these days can cost more than \$15. Skip one trip to the movies and you'll save enough to buy the \$14.95 package Ex-



pert Home Design 3D.

Installation is relatively smooth. You can run the program either from the CD, which requires only 2MB of disk space, or from your hard disk, which requires 12MB.

The clean interface consists of a grid, self-explanatory menus, a design toolbar, and a 3-D viewing toolbar with icons for looking, walking, and flying around your design. The scroll speed for these views is adjustable.

The comprehensive design toolbar allows you to draw

walls, place and manipulate objects, and perform a variety of other editing tasks. The main toolbar above the grid allows you to perform basic functions, change the camera angle, change the active floor (the product supports designs of up to three floors), and switch the 3-D style among wireframe, solid white, shaded grays, and solid or shaded colors.

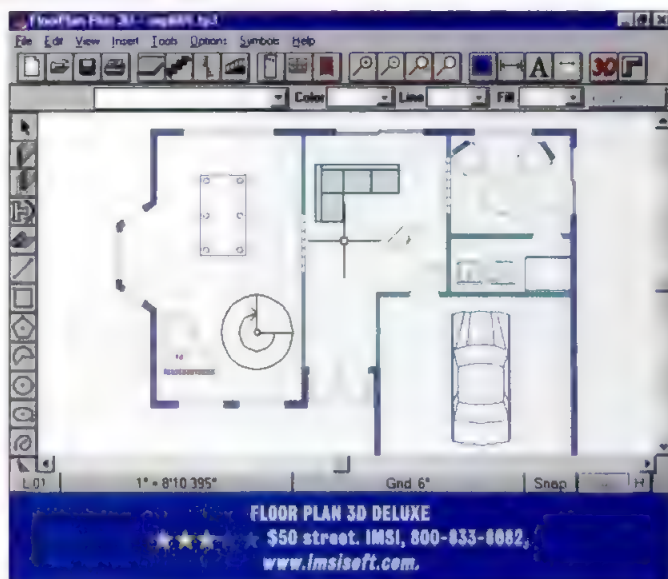
You can also use this package to amortize loans and estimate costs for your design. The loan amortization feature can be used to determine a loan amount, an interest rate, the number of years required for repayment, payments per year, and total interest charges. The cost estimation feature uses home size, cost per square foot, and cost of lot to approximate the cost for your design.

The program can export designs in 2-D and 3-D DXF file formats. Home Design 3D isn't for the number-crunching home designer, but it will suit those who are looking for a simple, low-cost design program.—*BK*

FloorPlan 3D Deluxe

FloorPlan 3D Deluxe is actually a bundle of five programs: FloorPlan Plus 3D, 3D Design Plus (an object-editing tool), Garden Designer, Quick and Easy Estimator, and HomeStyles Home Plans. Unfortunately, a disappointing lack of both integration and ease of use keeps this product from reaching its full potential.

The lack of integration jumps out at the user almost immediately. During a full install, the setup wizard tells you to reboot the computer



before all the elements are loaded. Although you can bypass this instruction, it is potentially frustrating. Once installed, the program provides a limited tutorial and a basic front end for its components. Also, we experienced some lockups and crashes on one of our test PCs.

The interface is less intuitive than others we reviewed. Instead of clicking and dragging walls, you must click to anchor a wall, drag it to the desired length, and click again to finish. Extra-click processes are common throughout the package.

FloorPlan 3D Deluxe does include an impressive array of over 1,500 objects and more than 1,000 sample floor plans.

Its 3-D images are decent but not outstanding. To view in 3-D, you place a camera in your plan, and the program then generates the layout in the 3-D Viewer applet. You can run multiple 3-D views at the same time but cannot easily tile these views. Changes to

the 2-D plan do not show up on already opened 3-D views.

The package is rounded out with a detailed roof editor and an estimator program that produces detailed bill-of-sale reports.—*Michael N. Rusignuolo*

myHouse for Windows 3.0

DesignWare's myHouse for Windows 3.0 has powerful features and a few innovations, but it suffers from some complicated processes and frustrating conventions.

We were able to jump right into the program but found that some of the options were nonintuitive. For example, wall placement is performed with an awkward click-drag-click process.



New SurgeStation™: the most advanced features ever designed by our customers

"I want to plug a telephone line and a modem dataline into the same surge protector."

"I want to plug in transformer blocks and keep all outlets open."

"I need more outlets for peripherals."

"I need some outlets that are always on."



The Challenge

Surge suppression is vital to the health of your electronic equipment.

The SurgeStation™, APC's latest offering, accepts the challenge issued by APC customers to incorporate several "dream features" while maintaining the key elements and high-performance that make SurgeArrest™ one of the best selling surge suppressors in the world.

Not all surge protectors are alike

Life presents many risks, most people seek out the best insurance to reduce the threat of these risks, so why would you trust the protection of your PC to some outlet strip? APC is the world leader in power protection; we provide you with premium, reliable surge protection, and the peace of mind that comes from knowing you have the best protection.

All the Features You Wanted

SurgeStation products now include: Eight outlets - three spaced to handle transformer blocks easily, a new building wiring-fault indicator, a right-angle plug to maximize your work space, and a switch large enough to be pressed on with your foot, but recessed enough to prevent accidental turn-off.

Whether you need basic protection, or the best protection money can buy, APC has a SurgeStation to meet your needs. Each SurgeStation model offers the best protection from lightning strikes and everyday power surges that can cause hardware damage and data loss. Every model carries a lifetime equipment protection policy; If connected equipment is ever damaged by a surge or lightning strike, APC will replace up to \$25,000* worth of that equipment. With power prob-



Building/Site Wiring Fault Indicator

SurgeStation is equipped with a Building/Site Wiring Fault LED that identifies dangerous wiring problems before you plug in your equipment.

SurgeStation also comes in models with built-in telephone and built-in cable and telephone protection.



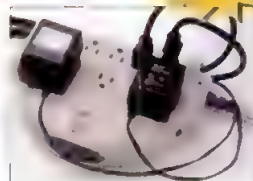
Protection Working Indicator

A Protection Working LED warns you if SurgeStation circuitry is ever damaged. APC will then replace the damaged SurgeStation for free under its lifetime warranty.*



Right-angle Plug

SurgeStation's space-saving plug design allows the cord to be flat against the wall.



8 Outlet Floor Models

Eight outlets on SurgeStation floor models provide ample space for equipment plugs with transformer blocks.

lems virtually guaranteed to damage unprotected electronics, you won't find a better protection value.

For Home Office/Small Office Applications

The SurgeStation series offers premium protection for small business/home office computers, high-performance stereo and video equipment, laser printers, and modems.

So join the over 8,000,000 satisfied computer users who say "ProtectME!" with APC.

Lifetime Equipment Protection Policy

With the Lifetime Equipment Protection policy, your equipment connected to SurgeStation is protected. (*See policy for details.)



SurgeArrest and SurgeStation

APC products are available at:

In addition to APC's best-selling SurgeArrest line, look for the following SurgeStation model options:



Telephone & AC Protection
2 Telephone & AC Protection
Cable/Telephone & AC Protection



Micro
WAREHOUSE

Insight

COMPUSA

BUY

MICROCENTER

Fry's

CIRCLE 342 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink
©1997 APC. All Trademarks are the property of their owners. SA01EF 1800-347-FAUX PowerFax

E-mail: apcinfo@apcc.com

132 Fairgrounds Road, West Kingston, RI 02892 USA

FREE How to buy Guide Surge Protection!

Just complete the information below and send to APC to receive your FREE Guide to Surge Protection.

- ☐ YES! Send me the FREE Surge Protection buying guide.
☐ NO, I'm not interested in SurgeStation at this time but please add me to your quarterly newsletter mailing list.

Name: _____

Address: _____

City/Town: _____

State: _____ Zip: _____ Country: _____

Phone: _____

Title: _____

Company: _____

Brand of surge suppressor used? _____

Brand of PCs used? _____

Are you familiar with UPSes? ☐ Yes ☐ No

APC Dept. 64-8
(888) 288-APCC x8288
Fax: (401) 788-2787
www.apcc.com

APC has won more awards for reliability than all other UPS vendors combined.



After Hours

myHouse for Windows does contain some nice touches. The most innovative feature is the way the program handles multiple stories. Successive floors are layered and are separated by Microsoft Excel-style tabs at the bottom of the screen. Other niceties included a button that lines up adjoining walls automatically.

The program has a generous selection of over 2,000 sample floor plans and objects. Many of the objects are neatly organized into galleries, so selecting an object category brings up a useful secondary menu showing all of the available options. However, this secondary menu can block the part of the screen where you are working.

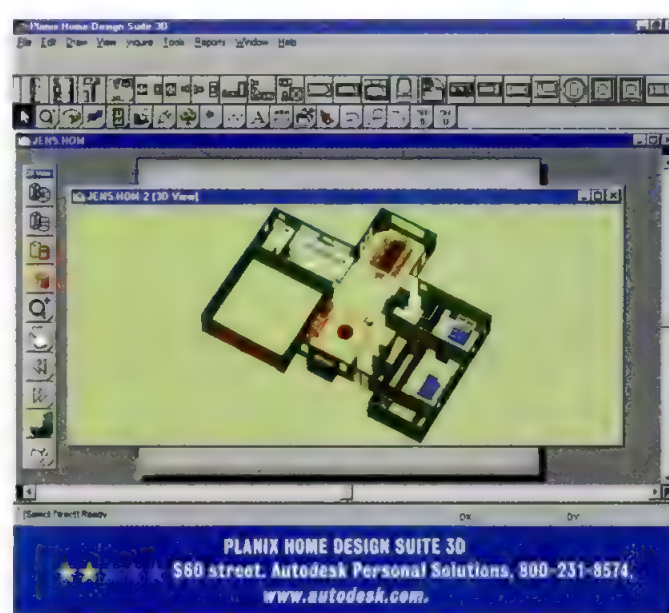
The 3-D features are decent, but they certainly could be improved. You can walk through your designs or set up an animated fly-through of your design. Unfortunately, the walk-through mode defaults to a wireframe image. You can render a full image at any time, but if you change your position the image returns to wireframe. To liven up your designs, you can apply texture maps to your walls and objects.

All in all, myHouse for Windows 3.0 is a solid design tool that could be much stronger with a few minor tweaks.—MNR

Planix Home Design Suite 3D

Since our last roundup ("Do-It-Yourself Design," June 25, 1996), Planix Home Design Suite 3D has added a Virtual Decorator feature that lets you place wallpaper and other details into 3-D designs. The rest of the package, however, is largely unchanged and is as complicated as ever.

Instead of multimedia tutorials, the package includes a written Getting Started Guide



that offers 20 printed "Two-Minute Tutorials." Home Design Suite 3D also includes an excellent user manual with practical applications and tips.

Unfortunately, novice users are going to need this guidance, since the program is often confusing. The task of adding a wall requires a complex process: selecting a tool, changing the input mode, right-clicking at the new wall's edges, and finally left-clicking to turn off the tool.

The design tools are contained in category buttons on the crowded main toolbar, and the buttons expand into even more categories. You can open a 3-D view next to your floor plan, but only from one perspective at a time, and the 3-D window can't be resized.

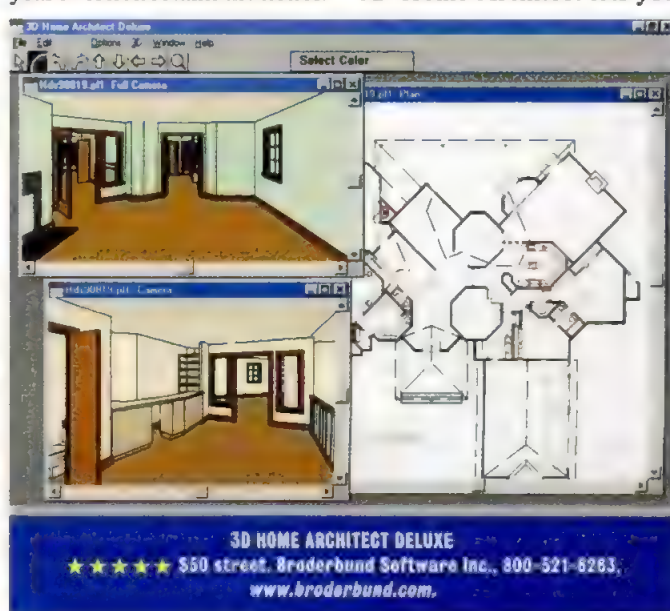
On the positive side, this product gives you a wealth of features. You can double-click on any element in a design to pull up an editable Specifications dialog box. You can also track the cost of any group of items, and the program automatically generates a bill of materials for each design.

There's no doubt that this is a powerful package, but it is far more complicated than

necessary. If you want to harness the power of Planix Home Design Suite 3D, be prepared to spend a lot of time with it.—Jennifer L. Anderson

3D Home Architect Deluxe

Broderbund Software's 3D Home Architect Deluxe was our Editors' Choice in last year's roundup ("Do-It-Yourself Design," June 25, 1996). This year's version retains the honor.



This is a complex yet streamlined program with an attractive interface that will appeal to home designers of all skill levels. In addition to the 400 room objects and 150 sample floor plans ready for drag-and-drop editing, this program boasts some other positive features that make designing your home easy.

You won't find an on-screen tutorial in this package, but the manual—which is written, comfortably, in plain English—includes a tutorial chapter. The program is very intuitive, though, and the 2-D floor-plan interface is easier to make sense of than most.

Editable Specifications dialog boxes for objects will appeal to the advanced user, while the novice will appreciate the program's SmartParts feature. SmartParts pays attention to how objects relate to one another, so it prevents you from placing them too close together. Also, the program automatically snaps walls together at the correct juncture.

To its slight disadvantage, 3D Home Architect's 3-D rendering is less than spectacular. But unlike other programs, 3D Home Architect lets you

SNAPPYTM

The PC's Best Picture Grabber
Just Got Even More Incredible

3.0



"Now the world's #1 way
to get astonishing pictures
into your PC is even better
with incredible new features,
higher quality and it costs less.
Is this a cool world or what?"

Kiki Stockhammer
Play Co-Founder
And Technology Evangelist
(Picture Grabbed With Snappy)



Now Only

\$99⁹⁵

M.S.R.P.*

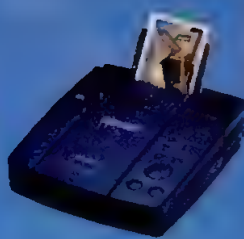
Get The Free Snappy Demo

www.play.com 800.306.PLAY

***More Snappy, Reduced Price**

PLAY
INCORPORATED

Tiny lawyer words: Play's Snappy and the Snappy logo are ours and thus trademarks of Play Incorporated. All other trademarks acknowledged. Play is a trademark of Play Incorporated, ©1997. All Rights Reserved.
CIRCLE 103 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



There are many obstacles faced by the small business owner. The most obvious being the word "small." But presenting a more impressive image of yourself is short work with Fujifilm digital products. And learning to use them is easy.

Both the DS-7 and the new DX-5 are simple to operate. For example, the DS-7's color LCD lets you compose pictures easily and play them back immediately. Both save images on our SmartMedia™ removable storage in JPEG format, so importing them to Windows® or Macintosh™ applications is quick and easy. And with the new FlashPath floppy disk adapter, which is unique to SmartMedia, images can be accessed instantly



DS-7 Digital Camera



DX-5 Digital Camera

has to know you're a small business.

SmartMedia is a trademark of Toshiba Corp. Windows is a registered trademark of the Microsoft Corporation. Macintosh is a trademark of Apple Computer, Inc. Adobe PhotoDeluxe is a trademark of Adobe Systems, Inc. CSA Contract # GS-25F-6119D ©1997 Fuji Photo Film U.S.A., Inc.

on all computers without cables or software. The DS-7 also comes with Adobe PhotoDeluxe™ software for easy editing and creation of Web pages and newsletters. The new DX-5 was designed with small budgets in mind. It has many of the same features as the DS-7, like SmartMedia and immediate image access. And its optical viewfinder and automatic flash deliver outstanding picture quality.

If you happen to wear many hats, you'll appreciate our virtually maintenance-free NC-2 printer. It's both digital- and video-compatible and creates high-quality, color photographic prints without toner, inks or cartridges. With hard work and a bit of luck, your headquarters will soon look as sharp as our images. Until then, schedule meetings at the client's office.

For more information, visit our Web site at www.fujifilm.com or call 1-800-800-FUJI.

 **FUJIFILM**

YOU CAN SEE THE FUTURE FROM HERE.



OfficeMax

SEARS

RITZ CAMERA

KITS

CIRCLE 283 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

THE WORLD'S MOST POPULAR GRAPHICS SOFTWARE

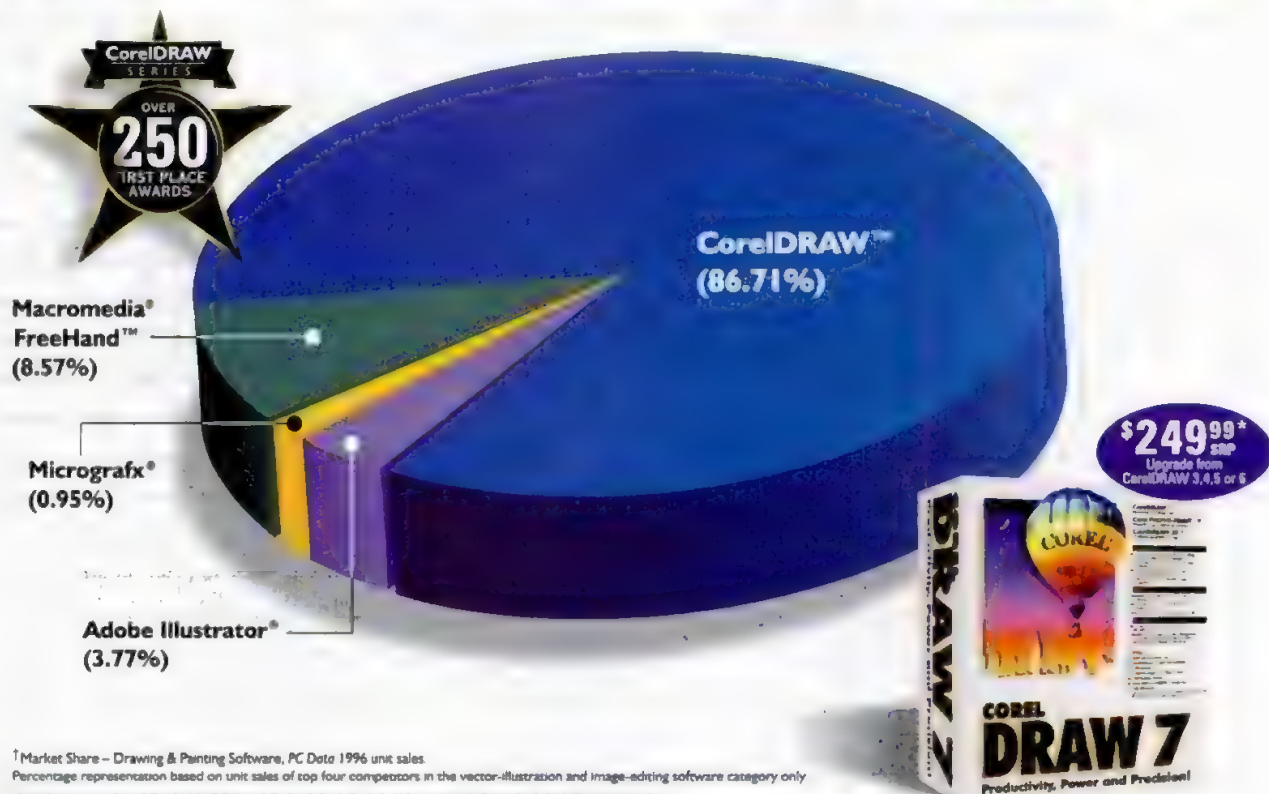


COREL DRAW 7™

The numbers speak for themselves.

With more than 85% market share†, CorelDRAW™ continues to be the graphics standard for professionals in the Windows® market. CorelDRAW 7, the latest version of the award-winning suite, combines powerful, easy-to-use tools for illustration, page layout, photo editing, and 3D modeling and rendering. And each application has the precision and speed you demand from your software. Go with the first choice of illustration professionals. Let CorelDRAW 7 intensify your creative genius.

86.71%†
Windows®
market share



†Market Share - Drawing & Painting Software, PC Data 1996 unit sales

Percentage representation based on unit sales of top four competitors in the vector-illustration and image-editing software category only

CIRCLE 332 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



COMPUSA
THE COMPUTER SUPERSTORE
1-800-COMPUSA

STAPLES
1-800-333-3336

STAPLES



Corel Office at World Tour Sponsor
of the COREL WTA TOUR



www.corel.com/locations

COREL
www.corel.com
Call now for faxed literature!
1-613-728-0826 ext. 3080
Document # 1085

Copyright © 1997 Corel Corporation. All rights reserved. Corel and CorelDRAW are trademarks or registered trademarks of Corel Corporation and Corel Corporation Limited. Micrografx is a registered trademark of Micrografx, Inc. Macromedia is a registered trademark and FreeHand is a trademark of Macromedia, Inc. Adobe Illustrator is a registered trademark of Adobe Systems Incorporated. All other product, font and company names and logos are trademarks or registered trademarks of their respective companies.



**Get there faster with the Hayes™ ACCURA™ 56K modem—
blazing speed, optimum connectivity and Hayes reliability.**

Green light your need for speed with a Hayes ACCURA 56K modem. It offers the unparalleled speed and connectivity of K56flex, the leading protocol developed by Rockwell International and Lucent Technologies. Best yet, all Hayes modems are backed by legendary Hayes reliability...further assuring you of a flawless entry into the fast lane.

K56flex connectivity is now available from a host of Internet Service Providers, including:



For a listing of K56flex Internet providers,
see our website at www.hayes.com

Or call 1.800.374.8388, ext. 411.



How fast do you want to get there?™

Attention: Actual telephone throughput will depend on telephone line conditions. Call Hayes Online: 770-444-6336. Hayes Worldwide Web Site: <http://www.hayes.com> or Tolnet to "hayes.com." © 1997 Hayes Microcomputer Products, Inc., P.O. Box 105293, Atlanta, GA 30348. Hayes, the Hayes logo, Accura and "How fast do you want to get there?" are trademarks or registered trademarks of Hayes Microcomputer Products, Inc. K56flex is a trademark of Lucent Technologies and Rockwell International. All other marks and logos are trademarks of their respective companies.

CIRCLE 126 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

After Hours

open more than one 3-D view at a time.

3D Home Architect also includes a fairly robust roof design tool. The user has a lot of control here, but the interface is uncluttered and the number of tool icons is low.

3D Home Architect is powerful and surprisingly easy to learn, and its wide range of controls make it the top choice again this year.—JLA

Visual Home Deluxe

The sheer simplicity of Visual Home Deluxe earned it a place in our list of the Top 100 CD-ROMs earlier this year (September 9, 1997). Its colorful interface is packed with features yet remains easy to navigate. This title does require MMX but is perfect for first-time designers.

An interactive tutorial begins immediately after instal-

lation. When you finish the tutorial, you already have a basic floor plan that you can work into a final design.

Because the program separates the process of selecting rooms from that of placing furniture, it's easy to modify your design. After positioning all of your rooms, you can hit the Build Rooms button to generate a 2-D floor-plan view, which appears right next to a corresponding 3-D view; no repositioning of windows is necessary.

This simplicity comes with limitations: You won't find advanced design features such as a grid for 2-D placement.

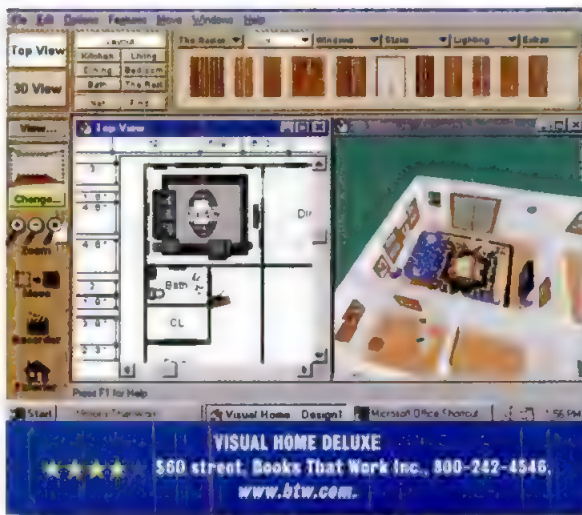
You can export 3-D images as bitmaps but not as .DXF files. Also, Visual Home Deluxe offers no specific feature for

brand-name appliances and furnishings.

You can also walk through your 3-D design—to the sound of footsteps, no less. The WalkAbout feature lets you plot a path through your floor plan, play back the path as a tour, and record and save it as an .AVI file.

Visual Home Deluxe also includes a roof designer, as well as a shopping list that automatically tracks your material expenses.

Novices will appreciate the usability of Visual Home Deluxe, and advanced users may be surprised by its range.—JLA



multistory design. On the other hand, its 3-D rendering is better than most, and the package comes with over 2,000 objects representing

How much
time do
you waste
backpacking?

Whether you're learning to type or just want to improve, one teaching system rises above the rest. Mavis Beacon Teaches Typing. In new Version 8, Mavis gives you tips on healthy typing habits and office ergonomics. And only Mavis adjusts to your skill level and continually monitors your progress, like a good teacher should. Just ask any of her five million alumni. For more information and the name of your local retailer, call 800-234-3088.



Type better. Work faster.



MINDSCAPE®
CIRCLE 012 ON READER SERVICE CARD
OR GO TO WWW.PCMAG.COM/ProductLink
© 1997 Mindscape, Inc. All rights reserved.



Playing with a Short Fuse

The frenetic game of pyrotechnics successfully makes the jump from console to PC.

Atomic Bomberman

Just as the movie industry is recycling classic TV shows, computer game developers are bringing back—and breathing new life into—classic arcade games. The best example of this trend is the new PC version of the Super NES game Atomic Bomberman. This simple but highly addictive game offers plenty of new features as well as fun, multiplayer excitement.

Atomic Bomberman is a Windows 95 game that requires a Pentium/60 with 16MB RAM. We had no problems getting the game to run with this configuration.

The strategy for Bomberman is simple: victory by attrition. As you navigate a small playing area, you must blow

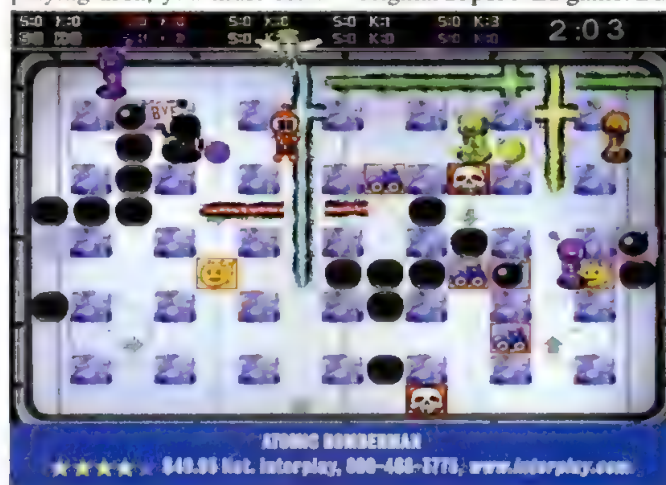
away bits of the landscape (to gain more breathing room) with cartoon-style, short-fused bombs—while also trying to blow your opponents into next week.

For the nostalgic, the game includes a classic mode that accurately reproduces the original Super NES game. But

the greatest fun to be had is in the new enhanced mode (available only on PCs that have at least 32MB RAM). This mode injects plenty of humor and personality into the game. You get power-ups, diseases, and lots of grim animation with 24 different comedic death scenes, including a trapped Bomberman who starts digging his grave when he knows the end is seconds away.

One problem is that playing against the computer is tough, tough, tough. You'll probably have a lot more fun playing against your friends.

If you're looking for a game that you and your friends can play to kill a few minutes (or hours, or days), Atomic Bomberman packs plenty of punch.—Shane Mooney



Saving the Best for Last

The last in a series, Pacific General more than lives up to its lineage.

Pacific General

With the release of Pacific General, Strategic Simulations brings its 5-Star Series to an impressive close. This latest descendant of the original Panzer General engine is the best game in the series.

Pacific General is a Windows 95 war game that requires a Pentium/90 with 16MB RAM. It runs well on this configuration, though it gets a little sluggish during larger battles.

The game puts you in command of the Allied (mostly American) or Axis (Japanese) war machine in the Pacific during World War II. Your goal is to lead your forces across the Pacific and ultimately win the war on your enemy's home turf.

Like its predecessors, Pacific General uses an easy-to-learn game system that helps keep the game approachable for novice players without sacrificing any of the intricacies that war game fans love.

Don't be fooled by the game's intuitive nature, however: Winning a campaign is difficult, thanks in large part to the game's outstanding artificial intelligence. The Allied campaign is particularly tough right from the outset: At Midway, you

must find and sink all of the Japanese carriers. Miss one flattop and the campaign is over.

Pacific General incorporates a number of subtle interface and game-play improvements over previous General titles. Also, because of the unique, island-hopping nature of the Pacific war, the game uses an excellent naval combat

mode that blends seamlessly with ground combat.

Another major bonus is the Battle Generator, a powerful scenario editor that lets you customize battles using any of the maps and units from this game, as well as any from Panzer General and Allied General.

The game has one significant failing: the inability to save your game during the unit-deployment phase before each scenario. You can get around this problem by saving your game often.

Even as we gear up for the imminent release of a completely revamped Panzer General II, Strategic Simulations proves that it saved the best for last in the 5-Star Series.—Michael E. Ryan



BETTER THAN ZIP.™

Considering a Zip? Did you know that the Shark 250 will "eat a Zip drive for breakfast" in every category? It's faster, holds more data, is 1/3 the size and weight of a Zip and requires only one cable connection and no outside power source. On top of all that, the Shark 250 is only \$199!



FASTER

Four times faster than the Zip,™ the Shark 250 can back up all your files, run all your applications, including full-motion video and audio, without a hitch.

HOLDS MORE STUFF

The last time we checked, 250MB of data was 2.5 times the capacity of 100MB of data. Wow! That's a lot of stuff.

SMALLER

The entire Shark 250 drive is small enough to fit in your pocket, weighs just 11 ounces (that includes everything you need), and uses removable 250MB HARDiskettes that are just a little bigger than a matchbook.

Notebook users rejoice!

Get your very own Shark 250 at CompUSA, Fry's, Computer City, Egghead, Sam's Club, PC MALL, Future Shop, or MicroWAREHOUSE.

For more information, call **888-GO-AVATAR** (888-462-8282), code PM10 or visit us at **www.goavatar.com**



©1997 Avatar Peripherals, Inc.® Shark 250 and HARDiskette are trademarks of Avatar Peripherals, Inc. All other names and trademarks are the property of their respective owners. *Windows Sources, June 1997 **PC Magazine Labs review, May 1997 *After \$50 mail-in rebate

4X FASTER

250 MB/HARDiskette

2.5X CAPACITY

1/3 THE SIZE

Shark

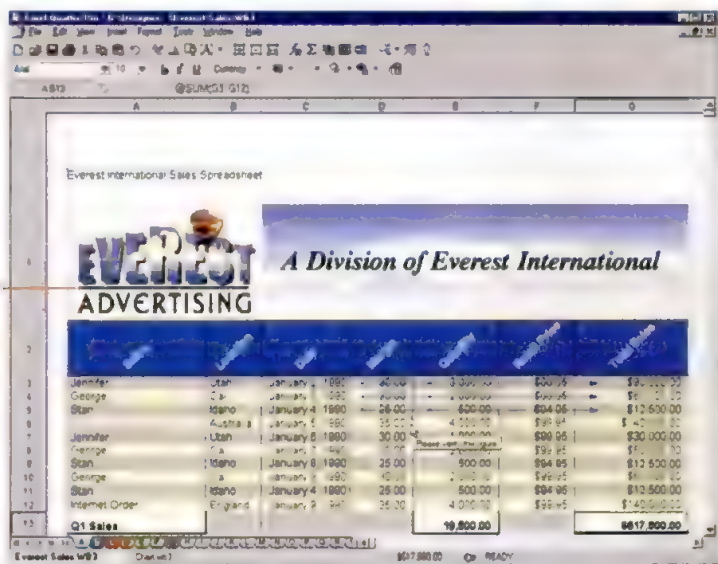
250
MOBILE
HARD DRIVE

Corel® WordPerfect® Suite 8

is the Only Office Suite

that Delivers

WYSIWYG Spreadsheets



A true WYSIWYG view means you can edit headers and footers, fine-tune margins and adjust print-to-fit settings—all onscreen without going to print preview, guaranteeing that what you see really is what you get

149,925.00	3,000.00	\$99.95
80,950.00	2,000.00	\$99.95
23,737.50	500.00	\$94.95
199,900.00	4,000.00	\$99.95
49,975.00	1,000.00	\$99.95
99,950.00	2,000.00	\$99.95
23,737.50	500.00	\$94.95
99,950.00	2,000.00	\$99.95
23,737.50	500.00	\$94.95
199,900.00	4,000.00	\$99.95
	19,500.00	

Cell Reference Checker™, just one of the many intuitive tools in Corel Quattro Pro 8, checks and fixes formulas automatically so you can reuse formulas without annoying error messages



For numbers that speak loud and clear, take advantage of Corel® Quattro® Pro 8—a powerful part of Corel® WordPerfect® Suite 8, the most innovative office software on the market. For all the great tools you've come to expect from your spreadsheet, plus features you won't find anywhere else, count on Corel Quattro Pro 8 for outstanding results every time.

"If you use the Web a lot, and especially if you depend on a corporate intranet, Netscape Communications' newest offering could be the most important application on your computer."
Business Week, June 23, 1997

"Netscape's New Browser Is The Best One Yet."
Fortune, May 26, 1997

"The release of Netscape Communicator 4.0 ushers in an exciting new era for corporations, end users, and applications developers alike. Just as the advent of business productivity suites changed the face of the software market, so should Communicator (and soon, IE 4.0) change the way corporations do business both internally and externally."

PC Magazine, August 1997

"All in all, Navigator 4.0 is the best Web browser available today."
Wall Street Journal, July 10, 1997

"Unlike Microsoft's Webcaster push technology, Netscape's Netcaster uses existing standards such as HTML, Java and JavaScript."

InfoWorld, June 2, 1997

"But there's further cause for celebration. For instance, Communicator 4.01 consumes about 3 MB of RAM less than Navigator 3.0."

C/Net, July 10, 1997

Corel® WordPerfect® Suite 8

Office Suite Excellence

Contact the reseller nearest you.



COMPUSA
THE COMPUTER SUPERSTORE
1-800-COMPUSA

OfficeMax
Taking Your Savings To The Max!
1-800-788-8080

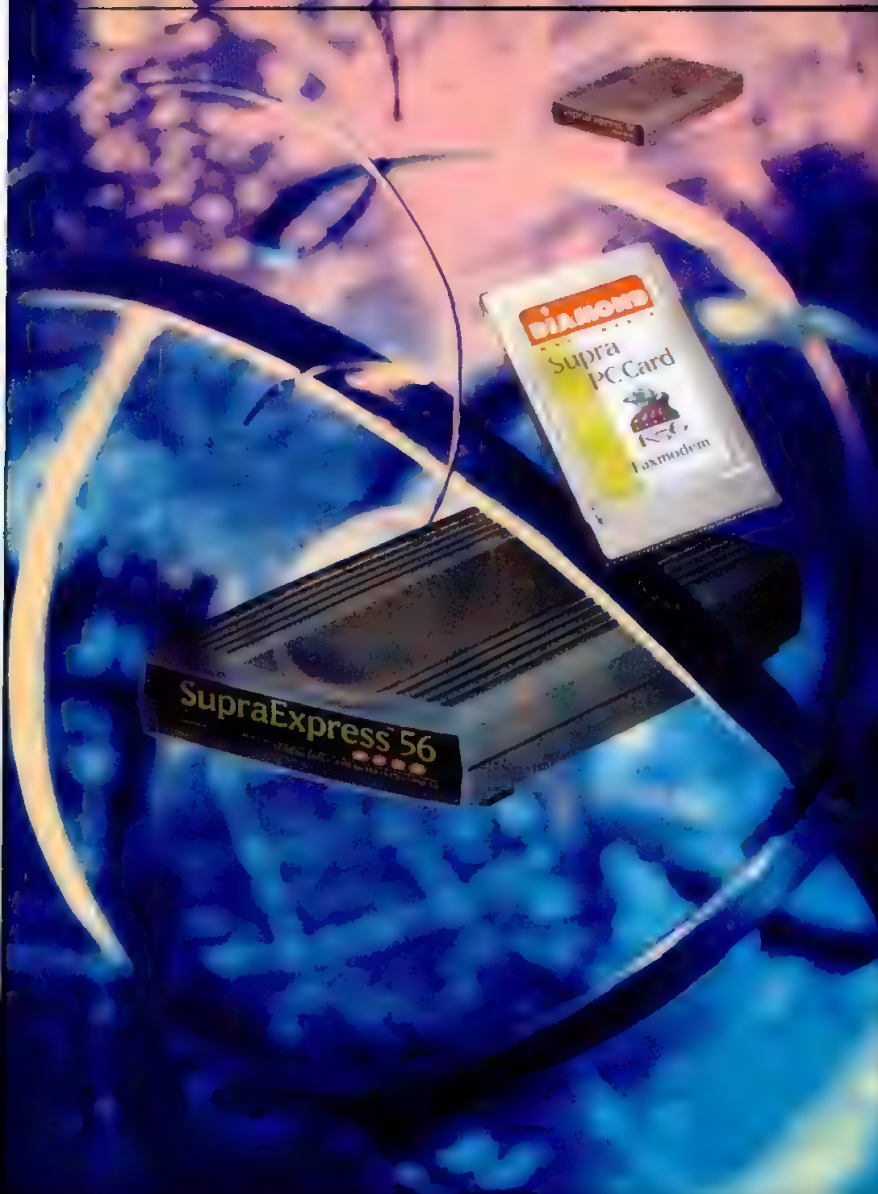
\$149.99*
Upgrade
CD-ROM version



COREL
www.corel.com
Call now for faxed literature!
1-613-728-0826 ext. 3080
Document # 1383

*For upgrade version only. US\$ plus applicable taxes and shipping. Dealer may sell for less. Prices may vary from store to store.
Copyright © 1997 Corel Corporation. All rights reserved. Corel, WordPerfect, Quattro Pro, Corel, Fit As You Go, QuickCharacter, QuickType and Formula Composer are trademarks or registered trademarks of Corel Corporation or Corel Corporation Limited. Microsoft is a registered trademark of Microsoft Corporation. All other product, font and company names and logos are trademarks or registered trademarks of their respective companies.

CIRCLE 037 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink



Presenting the

56K

modems

that didn't

begin as

33.6 modems.

- ▶ NEW DATAPUMP & DAA
- ▶ FLASH ROM
- ▶ CUSTOMIZED FIRMWARE
- ▶ 4X SRAM PERFORMANCE
- ▶ DTE RATE TO 230 KBPS

**"THE BEST COMBINATION OF
FAST TRANSFER SPEEDS AND
CONNECTION RATES"**

- PC WEEK



Visit www.diamondmm.com/56 now
to win a SupraExpress 56 modem!



SupraExpress and Supra PC Card 56 modems.

Unlike other 56K modems, Diamond Multimedia's affordable family of 56K modems were engineered from the ground-up to deliver the optimal 56K performance. Instead of rebuilding existing 33.6 modems, we designed totally new components for 56K. Our new datapump, digital signal processor, and crystal are all faster than ever before. We've also added four times more SRAM to speed the process and we've doubled the DTE rate for the highest possible throughput. Finally, customized firmware optimizes each modem's speed and its ability to connect and stay connected. So call 1-800-727-8772 or visit us on the Web for the facts. Then prepare yourself to experience the ultimate in 56K.

SupraExpress and Supra PC Card are trademarks of Diamond Multimedia Systems, Inc. All other trademarks are the property of their respective owners. ©1997 Diamond Multimedia Systems, Inc. All rights reserved.



Accelerate your world.

J&R COMPUTER WORLD

Corporate Leasing Available: 1-800-221-3191 (see below)

Scanners



Pacific Image ScanAce III
• 8.5" x 14" flatbed scanner • 36-bit color • Includes full Photoshop 4.0
\$899.99 after \$100 mail-in rebate
(PCF ACEIIIH-PC)
(Rebate expires 10/31/97)
ScanAce II for PC w/ImagePlus 260!
(PCF ACEII) **\$349.99**
ScanAce II for PC w/full Photoshop 4
(PCF ACEIIH-PC) **\$549.99**

Data Storage



16 PACK SOLD SEPARATELY

Imega Zip™ Drive
External 100MB Disk Drive
• Uses removable and replaceable Zip disks (200MB with compression)
\$149.99 (BER ZIP100PAR)
SyQuest EZFlyer 230 Ext. SCSI Drive
(SYQ EZ230EXTPC) **\$149.99**
Imega Jaz 1GB Ext. SCSI Drive
(BER JAZEXTSCSI) **\$399.99**
SyQuest SyJet 1.5GB Ext. Hard Drive
(SYQ SYJET15E-08) **\$399.99**

Digital Cameras



Kodak DC120
Digital Color Camera
• Up to 1280 x 960 resolution • 2MB internal memory holds 20 exposures
• Viewfinder has 1.6" color LCD screen
\$799.99 (KOD DC120)
Kodak DVC300
(KOD DVC300) **\$199.99**
Minolta Dimage V with AC Adapter
(MIN DIMAGE-VIT) **\$599.99**
Sony DSC-F1
(SON DSC F1) **\$699.99**

Edutainment Software

Magix Music Studio (3.0)
\$39.99
Collier's Encyclopedia 1998
by Sierra On-Line **\$69.99**
DaVinci's Machines, volume 1
by MicroForum **\$29.99**
Family Fun Pack
by Sierra On-Line **\$34.99**
Highlights- Hidden Pictures
by Mindscape **\$29.99**
Jumpstart 1st Grade- Reading
by Knowledge Adv. **\$29.99**
Kindergarten Blaster
by Davidson **\$39.99**

Toshiba Satellite 225CDS

with 133MHz Pentium® Processor



• 12.1" DSTN color
• 16MB EDO RAM
• 1.34GB hard drive
• 10x CD-ROM drive
• 16-bit stereo sound
• 2MB video RAM
Lease for only \$176.00 a month!
\$1,899.99 (TOS PA1240U-56C)

Compaq Presario 1680

Color Notebook with 200MHz Intel® Pentium® Processor and MMX™ technology



• 12.1" TFT color LCD
• 32MB Synchronic DRAM
• 2.1GB hard drive
• 20x CD-ROM drive
• 33.6/14.4/56 modem w/ K56flex technology
Lease for only \$163.00 a month!
\$4,199.99 (CPQ 1680)

Toshiba Satellite Pro 445CDX

with 133MHz Pentium® Processor and MMX™ technology



• 12.1" FastScan color LCD display • 16MB EDO RAM expands to 144MB • 1.34GB hard drive • 3.5" removable floppy drive • 10x removable CD-ROM drive • 16-bit stereo sound with .WAV and MIDI • 2MB EDO video RAM
Lease for only \$94.00 a month! **Super Price** (TOS PA1241U-H6C)
Toshiba Satellite Pro 445CDT
• 133MHz Pentium Processor with MMX technology
• 12.1" TFT color LCD • 33.6Kbps voice/data/fax modem
Lease for only \$116.00 a month! **\$2,899.99** (TOS PA1241U-T6C)

Hitachi Mx166T Color Notebook

with 166MHz Intel® Pentium® processor with MMX™ technology



• 16MB RAM plus FREE 32MB RAM for a total of 48MB RAM!
• 2.1GB hard drive
• 12.1" TFT active-matrix color display
• 8x CD-ROM • 2MB VRAM • 33.6/14.4 modem
\$2,999.99 (PNY PD3082A) (HIT MX166T-001)
Lease for only \$120.00 a month!
SEE DETAILS BELOW

Hitachi VisionBook Plus

133MHz Notebook Computer



• 12.1" high-addressing color STN LCD • 1.44GB hard drive • Removable 1.44MB floppy drive, interchangeable with 10x CD-ROM drive
• 33.6/14.4 Kbps PCMCIA modem
\$1,799.99 (HIT 4140)
Lease 4140 for only \$172.00 a month!
SEE DETAILS BELOW
Hitachi VisionBook Plus
• 150MHz version (HIT 4150X) **\$2,299.99**

Hard Drives



Maxtor K0185120A
IDE 5.1GB Hard Drive
• Great performance and plenty of room for all your storage needs
\$379.99 (MXR K0185120A)
Seagate 2.5GB Hard Drive
(SAG ST52520A) **\$229.99**
Western Digital 3.1GB IDE HD
(WD 3100RTL) **\$289.99**
Maxtor 4.3GB IDE Internal HD
(MXR K0184300A) **\$329.99**

Targus Cases



Air Targus Universal Laptop Bag with Air Protection System
• APS puts a layer of pressurized air around your notebook for superior protection • Comes with extra pocket
\$99.99 (TAR CUN1A)
Universal Bag with Foam Padding
(TAR CUN1) **\$69.99**
Black Netopac for Small Notebooks
(TAR CND1) **\$39.99**

Tripp Lite



SMP Notebook Protector
FREE (reg. \$19.99) with purchase of one item below! (TTL SMP)
Tripp Lite 675-Watt UPS Battery Backup System
• Power and fax/modem protection
• Built-in noise filter • Tower design
\$249.99 (TTL BC-INT675)
Isobar 6 Ultra Surge Suppressor
(TTL IB66-ULT) **\$69.99**
Master Touch Computer/Modem Surge Protection Control Center
(TTL MT66+) **\$89.99**

Edutainment Software

Walt Disney Ready For Math With Pooh
\$34.99
Land Designer 3D (4.5)
by Sierra On-Line **\$39.99**
Math Workshop Deluxe- Active Mind
by Broderbund **\$29.99**
Music Maker (3.0)
by Magix **\$39.99**
Musician Plus
by G-Vox **\$119.99**
Preschool Success Starter- Active Mind
by Broderbund **\$29.99**
Ultimate Speed Reader
by Davidson **\$29.99**

Business Software

Corel WordPerfect Suite 8 upgrade
\$139.99
Bookshelf 98
by Microsoft **\$44.99**
DriveCopy
by PowerQuest **\$29.99**
Financial Consultant (1.11) for PalmPilot- Landware
by MicroSoft **\$34.99**
Home Essentials 97 upgrade
by Microsoft **\$99.99**
Kai's Photo Soap
by MetaCreations **\$44.99**
IntelliSynch for PalmPilot/Pilot
by Puma **\$49.99**

Business Software

IBM ViaVoice
\$99.99
Internet Phone (4.0)
by Vocal Tech **\$44.99**
Naturally Speaking Dragon Systems
by Symantec **\$199.99**
Norton Anti-Virus Multi-Platform
by Symantec **\$69.99**
Norton Utilities (2.0)
by Symantec **\$69.99**
PaintShop Pro (4.0)
by Jasc **\$49.99**
Partition Magic (3.0)
by PowerQuest **\$64.99**

TravRoute

Door-to-Door Co Pilot
\$399.99
PC Anywhere 32 (8.0)
by Symantec **\$139.99**
Quicken (6.0)
by Intuit **\$35.99**
QuarkXPress (3.32)
by Quark **\$599.99**
Uninstaller (4.5)
by CyberMedia **\$39.99**
Virus Scan (3.0)
by McAfee **\$49.99**
WinFax Pro (8.0)
by Symantec **\$99.99**

To Order Toll Free and Receive a Free Catalogue

800-221-8180

24 Hours, 7 Days, Anywhere in the USA
PARK ROW • NEW YORK • NY • 10038 FAX: 1-800-232-4432

MAIL ORDERS: J&R Computer World, Dept. CP1021

• 59-50 Queens Midtown Expressway • Maspeth, Queens NY 11378
CALL 1-800-221-8180 for shipping information. DO NOT SEND CASH.

Not responsible for typographical or pictorial errors. Some quantities may be limited. All merchandise brand-new, factory-fresh and 100% guaranteed!



HP OfficeJet 570
Printer/Fax/Copier/Scanner
• Color and black & white printing, up to 600 x 600 dpi • Fax mode with 20-page auto document feeder • OmniPage LE OCR software
\$599⁹⁹ (HP C4643A)

HP LaserJet 5
LaserJet Printer
• 600-dpi print resolution • 12-ppm • 4MB RAM • For Windows systems
\$999⁹⁹ (HP C3916A)

Networking
3Com
Call us for all your network needs.

3-User Network Starter Kit
• Includes OfficeConnect 8-port hub, three Ethernet-III ISA 10Base-T cards and three 50-ft RJ-45 UTP cables
\$299⁹⁹ (3COM 3C50902B)

NDC Network Starter Kit (2 users)
(NDC ND772T) **\$79.99**,
after \$20 mail-in rebate
(*rebate expires 10/31/97)

3Com Etherlink III PCMCIA 10Base-T
(3COM 3C589D-TP) **\$129.99**



Sony CPD-2005X
17" Trinitron Color Monitor
• 15.9" viewable image • 0.25mm dpi
\$629⁹⁹ (SONY 2005X)

Panasonic PanaMedia E50 (13.1" vhs)
(PAN E50) **\$299.99**

Sony CPD-1005X (13.1" vhs)
(SONY 1005X) **\$339.99**

Panasonic PanaSync S70 (16" vhs)
(PAN S70) **\$599.99**

ViewSonic PT770 (16" vhs)
(VTM PT770) **\$749.99**

BUSINESS LEASING:
**No Money Down,
No Payments
for 30 Days!**

- 1) Allows flexibility to add or upgrade equipment at any time
- 2) Conserves your capital
- 3) Saves time, credit decisions are quick and easy
- 4) Covers entire packages—equipment, software, service contracts, and peripherals

*All lease payments are exclusive of applicable taxes. Minimum leasing payment is \$50 per month. All leases are subject to credit approval and require an administrative fee of \$49.95 to be billed on the first invoice. Leasing program administered by Data Commercial Credit. Leases are Business Leases. 30 days, 36 month term with 5:00 purchase option.

Call J&R Corporate Sales
1-800-221-3191 or
1-212-238-9080
(\$1400 Minimum Lease Amount)

J&R COMPUTER WORLD

Named RETAILER OF THE YEAR by Computer Retail Week

Compaq Presario 4528
MiniTower with 233MHz Intel® Pentium® Processor with MMX™ technology
• 32MB RAM
• 3.2GB hard drive • 24x CD-ROM
• 33.6/14.4 modem
• Monitor required
\$1,799⁹⁹ (CPQ 4528) 

Compaq Presario 4508
MiniTower with 200MHz Intel® Pentium® Processor and MMX™ technology
• 24MB Synchronous DRAM
• 3.2GB hard drive • 16x CD-ROM drive
• 33.6 modem
\$1,499⁹⁹ (CPQ 4508) 

Compaq Presario 2200
130MHz Multimedia Mini Desktop Computer
• 16MB EDO RAM, upgradable to 80MB
• 1.6GB hard drive • 8x CD-ROM drive • 1.44MB diskette drive • 33.6K/14.4 data/fax modem
• 64-bit 3D graphics with MPEG full-motion video
• 16-bit stereo • Integrated stereo speakers and Phantom subwoofer • Black chassis • Monitor required
\$799⁹⁹ (CPQ 2200) 

Hewlett-Packard Pavilion 8160
with 233MHz Intel® Pentium® processor with MMX™ technology
• 32MB EDO RAM
• 6.0GB hard drive
• 24x CD-ROM drive
• 33.6/14.4 data/fax modem with K56Flex download • Monitor is not included
\$1,899⁹⁹ (HP 8160) 

IBM® Aptiva® MiniTower with 233MHz Intel® Pentium® processor w/ MMX™ technology
• 32MB EDO RAM
• 4.2GB hard drive
• Built-in DVD player reads CD-ROMs
• 33.6/14.4 modem, upgradeable to 56K • Monitor sold separately
Super Price (IBM 2161-C30) 

PC Game Controllers
ThrustMaster Formula T-2 Driving Control
\$129⁹⁹ (THR FORMULAT2)
Wizard Pinball Controller
(THR PINBALL) **\$119.99**
Flight Control System Pro
(THR FLIGHTPRO) **\$119.99**
Rudder Control System
(THR RUDDERPEDAL) **\$119.99**
F-22 Pro Programmable Joystick
(THR TMF22) **\$139.99**

Apple® Macintosh®
Power Macintosh® 6500/250
• 250MHz PowerPC 603e • 48MB RAM • 4.0GB HD • 100MB Zip drive • 12x CD-ROM • Requires monitor
\$2,299⁹⁹ (APP M5612LL/A)
Power Macintosh® 6500/225
• 225MHz PowerPC 603e processor • 32MB • 3GB HD • 12x CD-ROM
\$1,799⁹⁹ (APP M5611LL/A)

Personal Digital Ass'ts
Psion Series 5 Handheld Computer
• 8MB RAM • Full VGA width touch sensitive screen with backlight
\$699⁹⁹ (PSN SERIES5)
Sharp YO-430 Personal Organizer
(SHA Y0430) **\$69.99**
Compaq C120 Personal Digital Ass't
(CPQ C120) **\$299.99**
U.S. Robotics Palm Pilot, Pro Ed.
(USR B0201U) **\$399.99**



Matrox MGA Millennium
Windows Accelerator Card
• 16.7 million colors @ 1280 x 1024
• 4MB VRAM • Fits PCI slot
\$189⁹⁹ (MOX 4MBPCMGMA)
Creative Labs Graphics Blaster 3D
(CLN G84381) **\$89.99**
Matrox Mystique 220
(MOX MY220P127N) **\$109.99**
ATI All-in-Wonder Video Card
(ATI 4MBWONDER) **\$249.99**

EPSON Printers
EPSON

Stylus® COLOR 400
Ink Jet Printer
• 720 x 720 dpi Photo Quality color and laser quality black text • Prints up to 4-ppm black and 3-ppm color
\$199⁹⁹ (EPS STYLUS-400)
Stylus COLOR 600 • 1440 dpi • 8-ppm black, 4-ppm color
(EPS STYLUS 600) **\$299.99**
Stylus COLOR 800 • 1440 dpi • 8-ppm black, 7-ppm color
(EPS STYLUS 800) **\$399.99**

PCMCIA Modems

Megahertz
Megahertz XJ1560
PCMCIA XJACK 56K
• 33.6 data 14.4 fax, 56K Internet downloads (x2) • PCMCIA Type 2 1x
\$269⁹⁹ (MHZ XJ1560)
US Robotics Sportster 33.6 PCMCIA
(USR SP1336) **\$199.99**
Motorola PCMCIA 33.6 Montana
(MOT PCMC336MONT) **\$169.99**
Megahertz PCMCIA XJACK 33.6
(MHZ XJ4336) **\$229.99**

Order Your Free Catalogue Now!



To Order Toll Free and Receive a Free Catalogue

24 Hours, 7 Days, Anywhere In The USA
1-800-221-3191

All Major Credit Cards Accepted

PARK ROW • NEW YORK • NY • 10038

FAX: 1-800-232-4432

CIRCLE 295 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

Want flowers?

The world's largest market is in Aalsmeer, Holland.

Want computer products?

The world's LARGEST online computer market is here:



www.netbuyer.com

Now, there's a computer store so large it won't fit in a building, so organized you can find what you want in a click, with onscreen sales help so expert it tells you specs, current prices, availability on every product—and even shows you reviews. Where? Online at: www.netbuyer.com. Come and see.

The service is free. It's new from **COMPUTER SHOPPER** and **ZDNet**.

WORLD-CLASS SHOPPING, BEST VALUES, WITH THE LARGEST ASSEMBLY OF TOP VENDORS ON THE PLANET SHOWCASING THEIR FULL LINE OF PRODUCTS. YOUR SURF IS OVER.



THE \$599 NETWORK-READY BUSINESS PARTNER

[MARTINIS AND GOLF CLUBS NOT INCLUDED]



Huge savings
on powerful
Dell® servers!

Recompute's Business Star is a complete system, network-ready out of the box. Starting at just \$599—with Pentium® processors from \$899—these Intel® processor-based computers fit into your office network effortlessly. Recompute takes commercial-grade systems from the biggest names in computers—Dell®, IBM®, Compaq®, HP®—and puts them through our 32-point remanufacturing regimen.

We add network cards, color monitors, surge protectors, a 30-day money-back guarantee, a one-year extendable warranty, next-day on-site service option and the most heroic tech support in the industry.

So call us today for desktops, notebooks, or servers.
We'll do lunch.



PENTIUM®
PROCESSOR-BASED
NOTEBOOKS
FROM

\$999



RECOMPUTE®

To order, Call toll-free

1-800-883-1749

Mon-Fri: 8 am - 8 pm / Sat: 8 am - 2 pm CST
Texas residents add 8.25% sales tax.

www.re-compute.com



COREL

WebMaster Suite

*All the power. Incredible value.
One integrated solution.*

Netscape - [Corel WebMaster Suite Homepage]

	Corel® WebMaster Suite	Microsoft® Front Page™ 97 with bonus pack
Vector illustration	✓	
Animation authoring	✓	
3D VRML	✓	
Image editing	✓	✓
Web page design	✓	✓
File conversion from major word processors	✓	✓
Database publishing	✓	
Web site management	✓	✓
Java™-based document publishing	✓	
Web server	✓	✓
Web browser	✓	✓
Free 30-day Web site hosting service*	✓	
Ready-made templates	226	56
Internet-ready images	8,000+	600+

Master the art of communicating on the Internet with Corel® WebMaster Suite, the *only* software package that delivers total creation and management power. Offering an extensive array of sophisticated Web tools, this unique suite offers incredible power at an incredible value.

Choose the competitor's alternative and scramble to get the job done with mismatched add-ons. Or go with Corel WebMaster Suite and get all the tools you need in one integrated solution. *Make the smart decision. Corel WebMaster Suite—make an impact!*



Over
\$1,000 US
in
software
value!†

For Windows® 95 and Windows NT® 4.0



COMPUSA
THE COMPUTER SUPERSTORE™
1-800-COMPUSA
1-800-266-7872

*Estimated retail price. US\$ plus applicable taxes. Dealer may sell for less. Prices may vary from location to location.

†30 days of free Web site hosting. Web site size limited to 5 MB. Number of visitors limited to 250 per day.

‡Based on suggested retail price of software modules if purchased separately.

Copyright © 1997 Corel Corporation. All rights reserved. Corel is a registered trademark of Corel Corporation or Corel Corporation Limited. Windows and Windows NT are registered trademarks of Microsoft Corporation. All other product, font and company names and logos are trademarks or registered trademarks of their respective companies.



KUR-0432-US

CIRCLE 103 ON READER SERVICE CARD OR GO TO WWW.PCMAG.COM/ProductLink

Advertisers' Index

COMPANIES

Reader Service No.	Advertiser	Page
*	A-Frame Software Company	349
030	A.T. Cross Company	121 @
297	ASP Computer Products	230
131	Accton Technology	222
087	Acer Peripherals America	96 @
092	Acer America	206-207 @
*	Adaptec	53
079	Advanced Micro Devices	140-141 @
054	Akia	209-211 @
081	Altec Lansing	354-355
162	American Power Conversion	247-249 @
341	American Power Conversion	273-275 @
342	American Power Conversion	357-359 @
172	Avatar Peripherals	367
355	Axis Communications, Inc.	252 @
*	bidnask.com	349
297	Cables to Go	230
292	Caere Corporation	8 @
*	Canon Computer Systems	146-147
*	Chrysler Corporation	194-195
*	Cloudscape, Inc.	349
*	Compaq Computer Corporation	74-75
*	Compaq Computer Corporation	102-103
*	Compaq Computer Corporation	190-191
*	CompUSA Direct	311-315
348	Computer Associates	243
129	COMPUTER DISCOUNT WAREHOUSE	81 @
121	COMPUTER DISCOUNT WAREHOUSE	82-83 @
318	COMPUTER DISCOUNT WAREHOUSE	84-85 @
360	COMPUTER DISCOUNT WAREHOUSE	86-87 @
159	COMPUTER DISCOUNT WAREHOUSE	288-289 @
158	COMPUTER DISCOUNT WAREHOUSE	290-291 @
109	COMPUTER DISCOUNT WAREHOUSE	292 @
*	Concurrent CAE Solutions	349
011	Corel Corporation	66-67 @
207	Corel Corporation	266 @
332	Corel Corporation	363 @
037	Corel Corporation	368 @
103	Corel Corporation	376 @
120	Crucial Technology	65 @
294	Cyber Media	227 @
343	Cyrix Corporation	149-156
215	Dayna Communications	231
*	Dell Computer Corporation	C4-C8
*	Dell Computer Corporation	78-79
*	Dell Computer Corporation	201
*	Dell Computer Corporation	276-277
*	Dell Computer Corporation	298
116	Deltec	226
*	Diamond Multimedia Systems	369
283	Dirt Cheap Drives	309 @
240	ESRI	283 @
004	Epson America	12-13 @
272	First Source International	302 @
152	Fluke Corporation	255 @

Reader Service No.	Advertiser	Page
293	Fuji Computer Media	362 @
*	Gateway 2000	36A-37
126	Hayes Microcomputer Products	364 @
*	Hewlett Packard	135
*	Hewlett Packard	137
*	Hewlett Packard	139
*	Hewlett Packard	160-161
*	Hewlett Packard	163
*	Hewlett Packard	165
*	Hewlett Packard	167
*	Hewlett Packard	213
*	Hewlett Packard	233
*	Hewlett Packard SureStore	244
143	Hitachi PC Corporation	62-63 @
*	IBM Corporation	176-177
*	IBM Corporation	179
*	IBM Corporation	251
*	ISC Consultants, Inc.	349
278	Insight Direct	306-307 @
*	Intel Corporation	57
*	Intel Corporation	94-95
*	Intel Corporation	116-117
*	InterSoft Argentina S.A.	349
*	Iomega Corporation	218-219
295	J&R Music World	370-373 @
335	JavaSoft	58-59 @
*	KeyLabs Inc.	349
106	Kingston Technology	256 @
019	L.A. Trade	303 @
075	LANSource Technologies	229 @
039	Mag InnoVision	18-19 @
365	Manugistics	217 @
299	McAfee Associates, Inc.	20
027	Micro Solutions Computer Products	322 @
003	Micro Warehouse	318-319 @
145	Microcom	236 @
*	Micrografx	69
119	Micron Electronics	16-17 @
013	Micron Electronics	48A-J @
203	Micron Electronics	15 @
*	Microsoft	C2-C4, p1
*	Microsoft	50-51
012	Mindscape	365 @
340	Minolta	122
221	Mita Copystar	144
036	Mitac International	280
153	NEC Computer Systems	2-3
156	NEC Computer Systems	31-34
154	NEC Computer Systems	185-188
155	NEC Computer Systems	202-203
*	NetFactory, Inc.	349
268	Nikon	14
117	Optiquest	180 @
*	Oracle Corp.	11
*	Pandescic	54-55

Reader Service No.	Advertiser	Page
047	PC Connection	296-297
330	PC Mall	300-301 @
080	PC Power and Cooling	92 @
068	PC Zone	299 @
*	PCs Compleat	311-315
014	Paragon	316 @
*	Paralogic Corporation	349
015	Philips Electronics	44 @
021	Phillips Business Electronics	221
193	Play Inc.	361 @
176	PowerQuest Corp.	174 @
287	ProGen Systems	214-215 @
*	ProtoView Development	349
074	Quantex	129-131 @
*	Recital Corp.	349
302	Recompute	375 @
205	Ricoh Corporation	142 @
*	Ringdale	241
309	S.A.G./Storage Solutions	22-23 @
374	Seagate Software	237 @
271	Seagate Technology	238 @
352	Softbank Expos	279
*	Sony Electronics	40-41
166	Spot Technology	317
*	SPSS, Inc.	295
*	SPSS, Inc.	321
057	Statsoft	43 @
135	Sun Microsystems	5 @
349	Tatung	90
001	Tektronix Inc.	126-127 @
066	TigerDirect	382-383 @
377	Toshiba America	264-265
070	Trend Micro	240
242	UMAX Technology	70-72
055	Unicent	197-199
008	Unisys Corporation	168-169 @
006	Unisys Corporation	175 @
*	US Robotics Inc.	109-112
*	US Robotics Inc.	234A-H
051	USA Flex	294 @
118	ViewSonic	88 @
*	Visio	216
*	Visioneer	106-107
*	WebMan Technologies, Inc.	349
*	WiGiTek Corporation	349
085	Winbook	77 @
*	Wyatt River Software	349
163	Xerox Corporation	269
*	Xircom	25
038	Yamaha Corp. of America	352
*	ZD Net	270
*	ZD Netbuyer	374

*No Reader Service#. Please Call Advertiser For Information.

Advertisers' Index PRODUCTS

Reader Service No.

Company	Product	Page
100% PURE JAVA		
A-Frame Software Company	Java Products	349
bidnask.com	Java Products	349
Cloudscape, Inc.	Java Products	349
Concurrent CAE Solutions	Java Products	349
ISC Consultants, Inc.	Java Products	349
InterSoft Argentina S.A.	Java Products	349
KeyLabs Inc.	Java Products	349
NetFactory, Inc.	Java Products	349
Paralogic Corporation	Java Products	349
ProtoView Development	Java Products	349
Recital Corp.	Java Products	349
WebMan Technologies, Inc.	Java Products	349
WiGiTek Corporation	Java Products	349
Wyatt River Software	Java Products	349
ACCELERATOR BOARDS		
Intel Corporation	Pentium 2	94-95
ANTI-VIRUS SOFTWARE		
McAfee Associates Inc.	VirusScan	20
BACKUP SOFTWARE		
American Power Conversion	Smart-UPS	247-249
American Power Conversion	Back-UPS Office	273-275
BRIDGES/ROUTERS/GATEWAYS		
Dayna Communications	NetCenter	231
CD-ROM		
Adaptec	Adaptec CD-R	53
Axis Communications, Inc.	AXIS CDROM Server	252
Yamaha Corp. of America	CD-R	352
CHIPS/PROCESSORS		
Advanced Micro Devices	K6 Microprocessor	140-141
Intel Corporation	Computer Enhancement Group	116-117
Kingston Technology	Memory	256
Pandesc	E-Commerce	54-55
COMMUNICATIONS SOFTWARE		
Microcom	Carbon Copy	236
Seagate Software	Seagate Software-NSMG	237
COMPUTERS/COMPATIBLES		
Akia	Desktops, Notebooks, LCD Panels	209-211
Compaq Computer Corporation	Desktops Direct	102-103
Compaq Computer Corporation	Servers	190-191
Compaq Computer Corporation	Monitors	74-75
CompUSA Direct	Mail Order	311-315
COMPUTER DISCOUNT WAREHOUSE	Hardware	288-289
COMPUTER DISCOUNT WAREHOUSE	Hardware	290-291
COMPUTER DISCOUNT WAREHOUSE	Hardware	292
COMPUTER DISCOUNT WAREHOUSE	Hardware	81
COMPUTER DISCOUNT WAREHOUSE	Hardware	82-83
COMPUTER DISCOUNT WAREHOUSE	Hardware	84-85
COMPUTER DISCOUNT WAREHOUSE	Hardware	86-87
Dell Computer Corporation	Notebooks/PCs	C4-C8
Dell Computer Corporation	Dimension	276-277
Dell Computer Corporation	Dimension	298
Dell Computer Corporation	Workstation	78-79
First Source International	Memory, Notebooks, Peripherals	302
Hewlett Packard	NetServer	163
Hewlett Packard	Desktop PCs	165
Hitachi PC Corporation	Hitachi VisionBook Elite Notebooks	62-63
J&R Music World	Systems, Hardware, Peripherals	370-373
Micro Warehouse	Hardware, Software, Peripherals	318-319
Micron Electronics	Service and Support	15
Micron Electronics	Vetix Servers	16-17
Micron Electronics	Micron Family of Products	48A-J
NEC Computer Systems	NEC NOW	185-188
NEC Computer Systems	NEC NOW	2-3
NEC Computer Systems	NEC NOW	31-34
PC Connection	PCs, Peripherals, Software	296-297
PC Zone	Mail Order	299
PCs Compast	Mail Order	311-315
ProGen Systems	Desktops & Notebooks	214-215
Quantex	Quantex Systems	129-131
Recompute	Computer	375
S.A.G./Storage Solutions	Servers and Storage	22-23
Tatung	Tatung TNB-5600 Notebooks	90
TigerDirect	Desktops	382-383
USA Flex	Notebooks, PCs, Peripherals, Printers	294
UMAX Technology	Computer	70-72
Unicent	Systems, Mail Order	197-199
Unisys Corporation	Aquanta Servers	168-169
Unisys Corporation	Aquanta Servers	175
Winbook	XP5 Pro and FX Notebooks	77
CONSULTING		
IBM Corporation	Small/Medium Business Solutions	176-177
IBM Corporation	IBM Corporate Channel	179
DATA BASE MANAGERS		
Computer Associates	ServerSuite	243
Oracle Corp.	Oracle InterOffice	11
DATA CARTRIDGES		
Paragon	Infinity	316
DESK TOP PUBLISHING		
Micrografix	Flowcharter 7	69
DIGITAL CAMERAS		
Fuji Computer Media	Fuji Digital Cameras	362
Sony Electronics	Digital Cameras	40-41
DISK BACKUP & TAPE DRIVES		
Iomega Corporation	Jaz	218-219
Micro Solutions Computer Products	Backpack Bantam CD-ROM	322

Reader Service No.

Company	Product	Page
DISPLAY PANELS/PROJECTORS		
Akia	Desktops, Notebooks, LCD Panels	209-211
EDUCATIONAL SOFTWARE		
Corel Corporation	Presentations	266
Corel Corporation	Draw 7	363
Corel Corporation	WYSIWIG	368
Corel Corporation	Webmaster	376
Corel Corporation	Pro/Netscape Communicator	66-67
Cyber Media	Od Change	227
Microsoft	Microsoft Flight Simulator	50-51
ENTERTAINMENT SOFTWARE		
Corel Corporation	Presentations	266
Corel Corporation	Draw 7	363
Corel Corporation	WYSIWIG	368
Corel Corporation	Webmaster	376
Corel Corporation	Pro/Netscape Communicator	66-67
Microsoft	Microsoft Flight Simulator	50-51
FX/MODEM		
LANSource Technologies	FAXport	229
FLOWCHARTING SOFTWARE		
Micrografix	Flowcharter 7	69
Visio	Visio Standard	216
GRAPHICS SOFTWARE		
Caere Corporation	OmniForm	8
Corel Corporation	Presentations	266
Corel Corporation	Draw 7	363
Corel Corporation	WYSIWIG	368
Corel Corporation	Webmaster	376
Corel Corporation	Pro/Netscape Communicator	66-67
Micrografix	Flowcharter 7	69
Visio	Visio Standard	216
HAND-HELD PCS		
Hewlett Packard	Palmtops	167
HARD DRIVES		
Dirt Cheap Drives	Mass Storage	309
Iomega Corporation	Jaz	218-219
L.A. Trade	Memory, Hard Drives, PCMCIA	303
Paragon	Infinity	316
PowerQuest Corp.	Drive Image	174
Seagate Technology	Cheetah Disc Drive	238
HARDWARE		
A.T. Cross Company	I Pen	121
Adaptec	Adaptec CD-R	53
Altec Lansing	Speakers	354-355
Canon Computer Systems	MultiPass C3000	146-147
Compaq Computer Corporation	Desktops Direct	102-103
Crucial Technology	Micron Memory Upgrades	65
Dell Computer Corporation	Dimension	276-277
Dell Computer Corporation	Latitude	298
Diamond Multimedia Systems	56K Modem	369
Dirt Cheap Drives	Mass Storage	309
Ruka Corporation	One Touch	255
Fuji Computer Media	Fuji Digital Cameras	362
Hayes Microcomputer Products	Hayes 56K Modem	364
Hitachi PC Corporation	Hitachi VisionBook Elite Notebooks	62-63
IBM Corporation	IBM Networking	251
Intel Corporation	Computer Enhancement Group	116-117
Intel Corporation	Networking Products	57
Intel Corporation	Pentium 2	94-95
Iomega Corporation	Jaz	218-219
J&R Music World	Systems, Hardware, Peripherals	370-373
Kingston Technology	Memory	256
Micro Warehouse	Hardware, Software, Peripherals	318-319
Micron Electronics	Vetix Servers	16-17
Micron Electronics	Micron Family of Products	48A-J
Mita Copystar	Mita Copystar Printers	144
Mitac International	Notebook Computers	280
Optquest	Optquest V95 19" Monitor	180
PC Mail	Hardware, Software, Peripherals	300-301
PC Power and Cooling	Power Protection/Cooling Devices	92
PC Zone	Mail Order	299
Pandesc	E-Commerce	54-55
Paragon	Infinity	316
Quantex	Quantex Systems	129-131
Recompute	Computer	375
Ricoh Corporation	Ricoh Aficio Color Copiers	142
S.A.G./Storage Solutions	Servers and Storage	22-23
Seagate Technology	Cheetah Disc Drive	238
Sony Electronics	Digital Cameras	40-41
Tatung	Tatung TNB-5600 Notebooks	90
Tektronix Inc.	Graphic Printing and Imaging	126-127
TigerDirect	Desktops	382-383
UMAX Technology	Computer	70-72
Unisys Corporation	Aquanta Servers	168-169
Unisys Corporation	Aquanta Servers	175
ViewSonic	ViewSonic VP 140	88
HUBS		
Dayna Communications	NetCenter	231
Intel Corporation	Computer Enhancement Group	116-117
Intel Corporation	Networking Products	57
IMAGE EDITING SOFTWARE		
Visioneer	PaperPort Strobe	106-107
INPUT DEVICES		
Sony Electronics	Digital Cameras	40-41
INTERNET		
ASP Computer Products	EZ MAIL	230
Cables to Go	EZ MAIL	230
Cyber Media	Od Change	227
ESRI	ArcView Internet Map Server	283
JavaSoft	JavaSoft	58-59
Microsoft	Microsoft IE 4.0	C2-C4, p1

Advertisers' Index PRODUCTS

Reader Service

No.	Company	Product	Page
	Pandesc	E-Commerce	54-55
LABEL/FORM SOFTWARE			
292	Caere Corporation	OmniForm	8
LAN ADAPTER BOARDS			
	Intel Corporation	Computer Enhancement Group	116-117
	Intel Corporation	Networking Products	57
	Xircom	Ethernet	25
LAPTOP/PORTABLE COMPUTERS			
054	Akia	Desktops, Notebooks, LCD Panels	209-211
	Compaq Computer Corporation	Desktops Direct	102-103
	Compaq Computer Corporation	Monitors	74-75
	CompUSA Direct	Mail Order	311-315
159	COMPUTER DISCOUNT WAREHOUSE	Laptops	288-289
158	COMPUTER DISCOUNT WAREHOUSE	Laptops	290-291
109	COMPUTER DISCOUNT WAREHOUSE	Laptops	292
129	COMPUTER DISCOUNT WAREHOUSE	Laptops	81
121	COMPUTER DISCOUNT WAREHOUSE	Laptops	82-83
318	COMPUTER DISCOUNT WAREHOUSE	Laptops	84-85
360	COMPUTER DISCOUNT WAREHOUSE	Laptops	86-87
	Dell Computer Corporation	Notebooks/PCs	C4-C8
	Dell Computer Corporation	Latitude	298
272	First Source International	Memory Notebooks, Peripherals	302
	Gateway 2000	Notebooks, PCs Mail Order, Peripherals	36A-37
	Hewlett Packard	Notebooks	160-161
143	Hitachi PC Corporation	Hitachi VisionBook Elite Notebooks	62-63
295	J&R Music World	Systems, Hardware, Peripherals	370-373
003	Micro Warehouse	Hardware, Software, Peripherals	318-319
036	Mitac International	Notebook Computers	280
068	PC Zone	Mail Order	299
	PCs Compleat	Mail Order	311-315
287	ProGen Systems	Desktops & Notebooks	214-215
349	Tatung	Tatung TNB-5600 Notebooks	90
066	TigerDirect	Notebooks	382-383
377	Toshiba America	Notebook Computers	264-265
051	USA Flex	Notebooks, PCs, Peripherals, Printers	294
008	Unisys Corporation	Aquanta Servers	168-169
006	Unisys Corporation	Aquanta Servers	175
085	Winbook	XP5 Pro and FX Notebooks	77
LOCAL RE NETWORKING			
131	Accton Technology	GroupLAN	222
355	Axis Communications, Inc.	AXIS CD ROM Server	252
348	Computer Associates	ServerSuite	243
159	COMPUTER DISCOUNT WAREHOUSE	Networking Products	288-289
158	COMPUTER DISCOUNT WAREHOUSE	Networking Products	290-291
156	COMPUTER DISCOUNT WAREHOUSE	Reseller	290-291
109	COMPUTER DISCOUNT WAREHOUSE	Networking Products	292
129	COMPUTER DISCOUNT WAREHOUSE	Networking Products	81
121	COMPUTER DISCOUNT WAREHOUSE	Networking Products	82-83
318	COMPUTER DISCOUNT WAREHOUSE	Networking Products	84-85
360	COMPUTER DISCOUNT WAREHOUSE	Networking Products	86-87
215	Dayna Communications	NetCenter	231
152	Fluke Corporation	One Touch	255
	IBM Corporation	IBM Networking	251
	Intel Corporation	Computer Enhancement Group	116-117
374	Seagate Software	Seagate Software-NSMG	237
MAIL ORDER			
054	Akia	Desktops, Notebooks, LCD Panels	209-211
	Compaq Computer Corporation	Servers	190-191
	Compaq Computer Corporation	Monitors	74-75
	CompUSA Direct	Mail Order	311-315
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	288-289
109	COMPUTER DISCOUNT WAREHOUSE	Reseller	292
129	COMPUTER DISCOUNT WAREHOUSE	Reseller	81
121	COMPUTER DISCOUNT WAREHOUSE	Reseller	82-83
318	COMPUTER DISCOUNT WAREHOUSE	Reseller	84-85
360	COMPUTER DISCOUNT WAREHOUSE	Reseller	86-87
283	Dirt Cheap Drives	Mass Storage	309
272	First Source International	Memory, Notebooks, Peripherals	302
	Gateway 2000	Notebooks, PCs, Mail Order, Peripherals	36A-37
278	Insight Direct	Insight Mail Order	306-307
295	J&R Music World	Systems, Hardware, Peripherals	370-373
019	L.A. Trade	Memory, Hard Drives, PCMCIA	303
051	USA Flex	Notebooks, PCs, Peripherals, Printers	294
047	PC Connection	PCs, Peripherals, Software	296-297
330	PC Mail	Hardware, Software, Peripherals	300-301
068	PC Zone	Mail Order	299
	PCs Compleat	Mail Order	311-315
074	Quantex	Quantex Systems	129-131
066	TigerDirect	PCs, Notebooks, Software	382-383
055	Unicent	Systems, Mail Order	197-199
085	Winbook	XP5 Pro and FX Notebooks	77
MAP SOFTWARE			
240	ESRI	ArcView Internet Map Server	283
MASS STORAGE			
172	Avatar Peripherals	Shark 250 Mobile Hard Drive	367
355	Axis Communications, Inc.	AXIS CD ROM Server	252
283	Dirt Cheap Drives	Mass Storage	309
	Hewlett Packard SureStore	Data Storage	244
	Imega Corporation	Jaz	218-219
027	Micro Solutions Computer Products	Backpack Bantam CD-ROM	322
038	Yamaha Corp. of America	CD-R	352
MEMORY			
106	Kingston Technology	Memory	258
019	L.A. Trade	Memory, Hard Drives, PCMCIA	303
120	Micron Electronics	Micron Memory Upgrades	65
MISCELLANEOUS			
	Microsoft	Microsoft Flight Simulator	50-51
012	Mindscape	Mavis Typing Tutor	365
193	Play Inc.	Snappy	361
205	Ricoh Corporation	Ricoh Aficio Color Copiers	142
MODEMS			
	Diamond Multimedia Systems	56K Modem	369
126	Hayes Microcomputer Products	Hayes 56K Modem	364
	US Robotics Inc.	X2 Networking Technology	109-112
	US Robotics, Inc.	X2 Networking Technology	234A-H

Reader Service

No.	Company	Product	Page
MONITORS			
087	Acer Peripherals America	Monitors	96
	Compaq Computer Corporation	Monitors	74-75
039	Mag InnoVision	Monitors	18-19
155	NEC Computer Systems	A&E Monitors	202-203
117	Optquest	Optquest V95 19" Monitor	180
015	Philips Electronics	Flat Screen Monitors	44
021	Philips Business Electronics	Monitors	221
118	ViewSonic	Viewsonic VP 140	88
MULTIMEDIA HARDWARE			
081	Altec Lansing	Speakers	354-355
	CompUSA Direct	Mail Order	311-315
027	Micro Solutions Computer Products	Backpack Bantam CD-ROM	322
	PCs Compleat	Mail Order	311-315
MULTIMEDIA SOFTWARE			
207	Corel Corporation	Presentations	266
332	Corel Corporation	Draw 7	383
037	Corel Corporation	WYSIWIG	368
103	Corel Corporation	Webmaster	376
011	Corel Corporation	Pro/Microsoft Communicator	66-67
	Micrografx	Flowchart 7	69
	Sony Electronics	Digital Cameras	40-41
NETWORK INTERFACE CARDS			
	Xircom	Ethernet	25
NETWORK SYSTEMS/EQUIPMENT			
152	Fluke Corporation	One Touch	255
	Hewlett Packard	Switch	233
NETWORKING SOFTWARE			
131	Accton Technology	GroupLAN	222
348	Computer Associates	ServerSuite	243
	Dell Computer Corporation	Workstation	78-79
	IBM Corporation	IBM Networking	251
145	Microcom	Carbon Copy	236
	Oracle Corp	Oracle InterOffice	11
OCR SOFTWARE			
292	Caere Corporation	OmniForm	8
163	Xerox Corporation	Xerox HomeCentre	269
ON LINE SERVICES			
	ZD Net	ZD Net	270
	ZD NetBuyer	NetBuyer	374
ORGANIZATIONAL SOFTWARE			
	Visio	Visio Standard	216
PC ACCESSORIES			
030	A.T. Cross Company	I Pen	121
283	Dirt Cheap Drives	Mass Storage	309
PC DIRECT			
	CompUSA Direct	Mail Order	311-315
159	COMPUTER DISCOUNT WAREHOUSE	Reseller	288-289
109	COMPUTER DISCOUNT WAREHOUSE	Reseller	292
121	COMPUTER DISCOUNT WAREHOUSE	Reseller	82-83
	Dell Computer Corporation	Latitude, Dimension	298
283	Dirt Cheap Drives	Mass Storage	309
272	First Source International	Memory, Notebooks, Peripherals	302
278	Insight Direct	Insight Mail Order	306-307
019	L.A. Trade	Memory, Hard Drives, PCMCIA	303
027	Micro Solutions Computer Products	Backpack Bantam CD-ROM	322
051	USA Flex	Notebooks, PCs, Peripherals, Printers	294
003	Micro Warehouse	Hardware, Software, Peripherals	318-319
047	PC Connection	PCs, Peripherals, Software	296-297
330	PC Mail	Hardware, Software, Peripherals	300-301
068	PC Zone	Mail Order	299
	PCs Compleat	Mail Order	311-315
014	Paragon	Infinity	316
	SPSS, Inc.	SPSS 7.5 for Windows	295
	SPSS, Inc.	all CLEAR	321
166	Spot Technology	Scanner	317
PCMCIA			
215	Dayna Communications	NetCenter	231
019	L.A. Trade	Memory, Hard Drives, PCMCIA	303
	US Robotics Inc.	X2 Networking Technology	109-112
	US Robotics, Inc.	X2 Networking Technology	234A-H
	Xircom	Ethernet	25
PERIPHERALS			
030	A.T. Cross Company	I Pen	121
215	Dayna Communications	NetCenter	231
	Diamond Multimedia Systems	56K Modem	369
004	Epson America	Epson Printer	12-13
272	First Source International	Memory Notebooks, Peripherals	302
293	Fuji Computer Media	Fuji Digital Cameras	362
	Gateway 2000	Notebooks, PCs, Mail Order, Peripherals	36A-37
126	Hayes Microcomputer Products	Hayes 56K Modem	364
295	J&R Music World	Systems, Hardware, Peripherals	370-373
340	Minolta	Printers	122
221	Mita Copystar	Mita Copystar Printers	144
117	Optquest	Optquest V95 19" Monitor	180
047	PC Connection	PCs, Peripherals, Software	296-297
330	PC Mail	Hardware, Software, Peripherals	300-301
001	Tektronix Inc.	Graphic Printing and Imaging	126-127
118	ViewSonic	Viewsonic VP 140	88
	Xircom	Ethernet	25
POWER PROTECTION			
162	American Power Conversion	Smart-UPS	247-249
341	American Power Conversion	Back-UPS Office	273-275
342	American Power Conversion	SurgeStation	357-275
116	Deltec	Uninterruptable Power Supplies	226
080	PC Power and Cooling	Power Protection/Cooling Devices	92
PRINTER ACCESSORIES			
	Ringdale	Fast Port	241

Advertisers' Index PRODUCTS

Reader Service No.	Company	Product	Page
PRINTERS			
004	Canon Computer Systems	MultiPass C3000	146-147
	Epson America	Epson Printer	12-13
	Hewlett Packard	OfficeJet Pro 1150C	213
340	Minolta	Printers	122
221	Mita Copystar	Mita Copystar Printers	144
295	Ricoh Corporation	Ricoh Aicio Color Copiers	142
001	Tektronix Inc.	Graphic Printing and Imaging	126-127
051	USA Flex	Notebooks, PCs, Peripherals, Printers	294
	Visioneer	PaperPort Strobe	106-107
PROGRAMMERS TOOLS UTILITIES			
348	Computer Associates	ServerSuite	243
176	PowerQuest Corp.	Drive Image	174
REMOTE COMPUTING			
	US Robotics Inc.	X2 Networking Technology	109-112
	US Robotics, Inc.	X2 Networking Technology	234A-H
	Xircom	Ethernet	25
SCANNERS			
268	Nikon	Scanner	14
166	Spot Technology	Scanner	317
SECURITY			
070	Trend Micro	NT Suite	240
SERVERS			
092	Acer America	Mobile Client Server	206-207
122	AST Research	Servers	26-27
	Compaq Computer Corporation	Servers	190-191
343	Cyrix Corporation	Servers	149-156
	Dell Computer Corporation	Notebooks/PCs	C4-C8
	Dell Computer Corporation	Servers	201
	Dell Computer Corporation	Dimension	276-277
	Dell Computer Corporation	Workstation	78-79
240	ESRI	ArcView Internet Map Server	283
	Hewlett Packard	NetServer	163
119	Micron Electronics	Vetux Servers	16-17
	Oracle Corp.	Oracle InterOffice	11
309	S.A.G./Storage Solutions	Servers and Storage	22-23
135	Sun Microsystems	Servers	5
008	Unisys Corporation	Aquanta Servers	168-169
006	Unisys Corporation	Aquanta Servers	175
SOFTWARE			
297	ASP Computer Products	EZ MAIL	230
297	Cables to Go	EZ MAIL	230
294	Cyber Media	Oil Change	227
240	ESRI	ArcView Internet Map Server	283
365	Manugistics	Statgraphics	217
299	McAfee	VirusScan	20
003	Micro Warehouse	Hardware, Software, Peripherals	318-319
	Microsoft	Microsoft IE 4.0	C2-C4, p1
	Microsoft	Microsoft Flight Simulator	50-51
012	Mindscape	Mavis Typing Tutor	365
047	PC Connection	PCs, Peripherals, Software	296-297
330	PC Mall	Hardware, Software, Peripherals	300-301
176	PowerQuest Corp.	Drive Image	174
	SPSS, Inc.	SPSS 7.5 for Windows	295
	SPSS, Inc.	all CLEAR	321
068	TigerDirect	Software	382-383
070	Trend Micro	NT Suite	240
	Vision	Vision Standard	216
163	Xerox Corporation	Xerox Homecentre	269
STATISTICAL SOFTWARE			
365	Manugistics	Statgraphics	217
	SPSS, Inc.	SPSS 7.5 for Windows	295
	SPSS, Inc.	all CLEAR	321
057	Statsoft	Statistical Software	43
TRAINING SOFTWARE			
012	Mindscape	Mavis Typing Tutor	365
TRAINING/SEMINARS/CONFERENCES			
352	Softbank Expos	Network & Interop	279
UTILITIES			
294	Cyber Media	Oil Change	227
299	McAfee Associates Inc.	VirusScan	20
176	PowerQuest Corp.	Drive Image	174
VIDEO GRAPHICS/BOARDS			
	Diamond Multimedia Systems	56K Modem	369
WEB/INTERNET SERVICES			
	Microsoft	Microsoft IE 4.0	C2-C4, p1
	Pandemic	E-Commerce	54-55
WINDOWS SOFTWARE			
348	Computer Associates	ServerSuite	243
365	Manugistics	Statgraphics	217
	Micrografx	Flowcharter 7	69
	Microsoft	Microsoft IE 4.0	C2-C4, p1
176	PowerQuest Corp.	Drive Image	174
	SPSS, Inc.	SPSS 7.5 for Windows	295
	SPSS, Inc.	all CLEAR	321
057	Statsoft	Statistical Software	43
	Vision	Vision Standard	216
163	Xerox Corporation	Xerox Homecentre	269
WORKSTATION SOFTWARE			
	Dell Computer Corporation	Workstation	78-79
WORKSTATIONS			
	Dell Computer Corporation	Workstation	78-79
	Hewlett Packard	Workstation	135
	Hewlett Packard	Workstation	137
	Hewlett Packard	Workstation	139

For Additional Categories see MARKETPLACE PRODUCT INDEX PAGE 323.

380 PC MAGAZINE OCTOBER 21, 1997

Coming Up

What's in the Next Issue of *PC Magazine*

38 Personal Printers

Which should you go with, a traditional laser printer or a color ink jet? If the price points are close enough, you'll be deciding based on other factors. Check here before you buy either.

9 Multifunction Printers

You've been hearing about them, but you don't know whether they're worth the trade-offs. We round up the latest generation of devices that print, fax, copy, and scan all in one box.

Personal Document Imaging

So much for the paperless office! What we need is a way to deal with all the paper that's there. These document-imaging packages help you store and manage paper electronically.

11 SOHO Scanners

Little cousins to flatbed scanners, these color sheet-fed scanners seem good choices where space is tight or the volume doesn't call for something bigger. We report on the quality of their scanning and on the kinds of jobs they're best suited for.



ZIFF-DAVIS INC.

Chairman and CEO Eric Hippeau

Presidents Ronni Sonnenberg, Claude Sheer (U.S. Publications), Jeffrey Ballowe (Interactive Media and Development Group), Terri Holbrooke (ZD Brand and Market Group), Bob Brown (Computer Intelligence), William Rosenthal (Training and Support Publishing Group) **Vice-Presidents** Timothy O'Brien (Chief Financial Officer), J. Malcolm Morris (General Counsel and Secretary), Rayna Brown (Human Resources), Daryl R. Otte (Planning), Mark Moyer (Controller), Steve Gladyszewski (Information Systems) **Treasurer** Thomas L. Wright **Director, Public Relations** Gregory Jarboe

U.S. Publications Group

Presidents Claude Sheer (U.S. Publications), Lawrence C. Burstein (Consumer Media Group) **Senior Vice-President** Baird Davis (Circulation) **Executive Vice-Presidents** Don Byrnes (Business Media Group), Jack Dolce (Business Media Group), Tom McGrade (Business Operations) **Vice-Presidents** Jim Manning (Marketing Services), Bob Bader (Central Advertising Sales), Mark Van Name (Product Testing), James F. Ramaley (Circulation Services), Al DiGuido (Group Publisher), Roger Hermann (Production), Chris Dobbrow, John Dodge, Jim Louderback, Michael J. Miller, Nancy Newman, Paul Somerson, Sam Whitmore **Executive Director, Licensing** Gertrud Borchardt **Director, ZD Labs** Mark Hall **Director, Benchmark Operation** Bill Catchings

Interactive Media and Development Group

President Jeffrey Ballowe **Executive Vice-President** David Shnaider **Executive Vice-President** Daniel Rosensweig (President, ZDNet) **Vice-Presidents** Daniel Farber (Editor-in-Chief, ZDNet), James Savage (General Manager, ZDNet), Richard Fisher (ZDTV) **Editorial Director, New Products** Bill Machrone

ZD Brand and Market Group

Presidents Terri Holbrooke, Bob Brown (Computer Intelligence) **Executive Vice-President** Joe Gillespie (Corporate Sales) **Vice Presidents** Herb Stern (ZD Brand), Elda Vale (ZD Research) **Executive Director, Sales Marketing** Mike Perkowski **Director, Corporate Relations** Gregory Jarboe **Ziff-Davis Media Network: Executive Director** Jeff Bruce **Managing Director** Rita Burke **Directors** Ken Beach, Michael Bird, Dan Daly, Melinda Maginn, Scott Murphy **Associate Network Directors** Robin Kofsky, Debbie Moss, Julie Tuttle

PC Magazine, ISSN 0888-8507, is published twice a month except in July and August, at \$48.97 for one year. Ziff-Davis Inc., One Park Ave., New York, NY 10016-5802. Periodicals postage paid at New York, NY 10016-5802 and at additional mailing offices. POSTMASTER: Address changes to *PC Magazine*, P.O. Box 54083, Boulder, CO 80328-4293. The Canadian GST registration number is 14049 6720 RT. Printed in the U.S.A.

Editorial Product Index

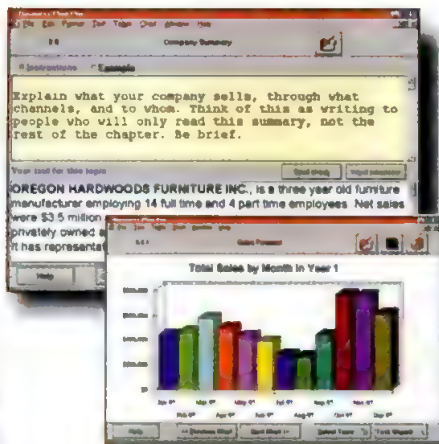
Reader Service No.	Product	Company	Page
502	Accura 56K PC Card	Hayes Microcomputer Products Inc.	108
461	AcerAltos 900Pro	Acer America Corp.	189
446	Alps MD-2300	Alps Electric (USA) Inc.	162
462	ALR Revolution 2X	Advanced Logic Research Inc.	200
463	AST Manhattan D6200	AST Computer	205
490	Best Data MACH 2 56K Data/Fax Modem	Best Data Products Inc.	105
491	Boca 56K Internet Modem	Boca Research Inc.	105
448	Canon BJC-4550	Canon Computer Systems Inc.	162
492	Cardinal Connecta Internal 56K Data/Fax Modem	Cardinal Technologies Inc.	105
	Compaq Deskpro 4000N	Compaq Computer Corp.	56
	Compaq ProSignia 200	Compaq Computer Corp.	208
465	Dell PowerEdge 2200	Dell Computer Corp.	212
410	Delorme AAA Map'n'Go 3.0	Delorme	45
493	Diamond SupraExpress 56e	Diamond Multimedia Systems Inc.	113
493	Diamond SupraExpress 56i Sp	Diamond Multimedia Systems Inc.	113
402	Digital HiNote Ultra 2000 VTX 5166M	Digital Equipment Corp.	60
466	Digital Prioris MX 6200	Digital Equipment Corp.	212
447	Eastman Kodak DS 8650 PS	Eastman Kodak Co.	164
449	Epson Stylus Color 1520	Epson America Inc.	164
449	Epson Stylus Color 3000	Epson America Inc.	164
494	E-Tech Cyber Bullet PC56 RVP	E-Tech Research Inc.	113
450	Fargo Pictura 310e	Fargo Electronics Inc.	166
450	Fargo PrimeraPro Elite	Fargo Electronics Inc.	166
495	Global Village TelePort 56 fax/modem	Global Village Communication	113
496	Hayes Accura 56K Fax Modem	Hayes Microcomputer Products Inc.	114
481	HiProf 1.01	TracePoint Technology Inc.	259
441	HP Color LaserJet 5M	Hewlett-Packard Co.	125
441	HP DeskJet 1000Cse	Hewlett-Packard Co.	170
408	IBM ViaVoice	IBM Corp.	64
401	Internet Phone Release 5.0.103	VocalTec Communications Ltd.	12
956	LabExpert 2.02	KeyLabs Inc.	235
955	LANDesk Configuration Manager	Intel Corp.	228
442	Lexmark Optra SC 1275n	Lexmark International Inc.	128
497	Logicode Quicktel 56W95-P	Logicode Technology Inc.	114
504	Megahertz XJ5560 PC Card	3Com Corp.	108
467	Micron Vetix LXI	Micron Electronics Inc.	217
411	Microsoft Expedia Trip Planner 98	Microsoft Corp.	45
958	Microsoft Systems Management Server 1.2	Microsoft Corp.	241
480	Microsoft Visual C++ 5.0 Professional Edition	Microsoft Corp.	258
958	Microsoft Zero Administration Kit	Microsoft Corp.	241
443	Minolta Color PageWorks	Minolta Corp.	132
498	ModemSurfr 56K Data/Fax Modem	Motorola Information Systems Group	115
957	ON Command Comprehensive Client Manager	ON Technology Corp.	239
403	Panasonic CF-35	Panasonic Personal Computer Co.	60
405	PowerLite 7000	Epson America Inc.	68
499	Practical 56K Internal Data/Fax K56flex	Practical Peripherals Inc.	120
451	QMS ColorScript 480	QMS Inc.	172
412	Rand McNally TripMaker Deluxe 98	Rand McNally New Media	45
953	RealSecure 1.0 for Windows NT 4.0	Internet Security Systems	250
468	S.A.G. STA Dual Pro	S.A.G. Electronics	219
404	Sony PCG-707C	Sony Electronics	60
452	Tally SpectraStar DSx	Tally Printers Inc.	173
452	Tally SpectraStar 280	Tally Printers Inc.	173
452	Tally SpectraStar T8050	Tally Printers Inc.	162
452	Tally T7070	Tally Printers Inc.	173
444	Tektronix Phaser 300X	Tektronix Inc.	178
444	Tektronix Phaser 350	Tektronix Inc.	136
444	Tektronix Phaser 380	Tektronix Inc.	178
444	Tektronix Phaser 450	Tektronix Inc.	178
444	Tektronix Phaser 480X	Tektronix Inc.	178
444	Tektronix Phaser 560	Tektronix Inc.	136
500	3Com Courier V.Everything	3Com Corp.	120
500	3Com Sportster 56K Faxmodem	3Com Corp.	120
413	TravRoute Software Door-to-Door 98	TravRoute Software	45
407	UMAX MDX-8000 Digital Camera	UMAX Technologies Inc.	76
951	Vienna.way	Vienna Systems Corp.	245
503	Viking FM56KP PC Card	Viking Components	108
952	V/IP Voice Gateway	Micom Communications	246
482	Visual Quantify	Pure Atria Corp.	262
406	ViviCam 3000 Digital Camera	Vivitar Corp.	76
483	VTune 2.4	Intel Corp.	263
445	Xerox DocuPrint C55mp	Xerox Corp.	143
501	Zoom/FaxModem 56K	Zoom Telephonics Inc.	120

"Everything you need to write a first-class business plan"



You Can Write A Plan The Hard Way—Or Buy This Program!

You've got a great business idea. You know it's a winner. Now you need to convince the key people. Like your banker. Management. Family investors. Venture capitalists. The SBA. Now you need a plan. A winning plan. Strong text backed by powerful numbers and colorful charts. The kind of plan you get with Business Plan Pro. Even if you've never done one before, don't worry. Business Plan Pro breaks the whole job down into seven easy steps. Just follow the on-screen instructions and you'll be guided through the entire plan-building process. Then — before you know it — you'll be ready to print a complete plan with all your text, charts, graphs and spreadsheets combined automatically. Business Plan Pro even includes ten real-life business plans that got funding from banks and the SBA using this exact same software. Thousands have done it. You can too! Order your copy today.



We all need help when writing a plan. Business Plan Pro includes straight talk and clear directions on what to say and how to say it. The spreadsheets come ready made. The charts and graphs are automatic. All you need to do is pop it in and get to work!

Create a powerful plan in seven steps:

- STEP 1 Pick your plan.** Choose from five types - Retail, Distribution, Manufacturing, Service, or customize your own.
- STEP 2 Describe your business.** Use your own words, or edit one of the sample plans inside — real plans that got real funding.
- STEP 3 Define the market.** Write about your customers, competition and market potential. No one knows your business better than you.
- STEP 4 Sell your team.** Now highlight the talents of your top management. Don't be shy. Here's your chance to really strut your stuff. Go for it!
- STEP 5 Forecast your sales.** Pump in your numbers and Business Plan Pro will calculate your charts, spreadsheets and graphs.
- STEP 6 Support your numbers.** A plan needs support. Not a numbers person? Don't worry. All the formulas, charts and graphs are built in.
- STEP 7 Print your plan.** One click and we'll assemble your plan — with text, charts and spreadsheets in perfect order — ready for business!

What the experts say...

"No business plan software can match Business Plan Pro for its navigational ease, customizability and superb integration."

"Automatically assembles your text, tables and charts into an attractive and easy-to-read report that you'll be proud to submit to bankers and venture capitalists."

"All the tools you need to craft a clear, detailed and well-presented plan."

"Combines a word processor, a spreadsheet, a charting tool and business tips — all in one compact program."



"Build an amazing marketing plan with Marketing Plus."



Before you build a plan, you need to know the market. How big is it? How fast is it growing? Who is your customer? Who is the competition? As you ask yourself these questions, Marketing Plus will help you hammer out the answers. First, you create a Strategy Pyramid. This pyramid makes it easy. You'll be able to organize your ideas into a clear, easy-to-read chart that anyone can understand. Okay, your strategy is on target. You've got a long list of exciting programs ready to

launch. Now it's time to plan your budget. Even if you never prepared a budget before, Marketing Plus makes it amazingly easy. It includes the essential spreadsheets you need with all the formulas built right in. Just plug in your numbers and Marketing Plus prepares your budget automatically. Only Marketing Plus gives you the ability to compare your forecasts against what actually happened. It's a powerful working tool that lets you measure your success every day. Marketing Plus gives you so many great options, you'll look like a pro. You can forecast sales by product, program, manager — even territory or region. Then, once you've entered your numbers, a single click turns your spreadsheets into powerful graphs and charts.

BUY BOTH AND SAVE \$20

Palo Alto Software			WIN95 • WIN3.1 • 16-BIT
Item #	Description	Price Each	
P02-2000	Business Plan Pro	\$97.99*	
P02-2002	Marketing Plus	\$97.99*	
SAVE \$20 BEST BUY!			
P02-2004	Business Plan Pro & Marketing Plus Bundle	\$174.99*	
*Includes 3.5" and CD-ROM.			

VISIT **WWW.TIGERBOOKS.COM** FOR GREAT SELECTION AND LOWEST PRICES ON THOUSAND OF COMPUTER BOOKS

The Complete Bundle With All The Utilities You'll Ever, Ever Need!



Adobe PageMill 2.0



TO ORDER: 800-685-8888

...Or visit our web site at WWW.TIGERDIRECT.COM. We accept VISA, MasterCard, American Express, Discover and Diners Club. All products carry Tiger's 30-Day GUARANTEE against defects. Returns for defective exchange only. Call us for exact shipping charges. We're here to help you 24-hours a day!

Get A FREE Tiger Catalog

Get a FREE subscription of the TigerDirect catalog — each issue features over 100 pages packed with new hardware, software, systems and accessories! You'll get the latest on the best that the computer industry has to offer, at the lowest prices! Call 800-685-8888.

COMPLETE SYSTEMS

Tiger builds great systems—for hundreds less than anyone else! We have the world's fastest PC: the Pentium II MMX, featuring the #1-rated Matrox Mystique 220 video, a huge 3.0GB hard disk, 32MBs of memory, 20X CD-ROM, 33.6K voice-enabled faxmodem (upgradable to 56K), quality Yamaha speakers and a lot more—for an unbelievably low price. We have the AMD-K6 MMX—rated faster than a Pentium MMX for hundreds less (A Tiger "Best Buy"). We also have the proven IBM 6x86 PR200 for just \$799. We pack the latest features in all our systems. You get pure quality and incredible high performance!

Pentium II MMX 266MHz. World's fastest! This amazing speed-burner comes ready to run with our best video—a Matrox Mystique 220 with 3D processing and 4MB of video memory. Excellent for high-performance graphics and action-packed 3D games! And to provide thundering realism to your favorite 3D games, we include a pair of digitally-tuned Yamaha high-fidelity speakers. For a reliable and fast foundation, our advanced 64-bit PCI motherboard has been specifically built from the ground up for the Pentium II processor. The Intel 440FX chipset delivers super PCI performance with its Concurrent PCI mode, and the two USB ports allow for plenty of future expansion. This ATX-format motherboard also features onboard ports that require no cables and no brackets, so you get full use of all 8 expansion slots. If you want the fastest, this is the system for you!

AMD-K6 MMX 233MHz. This system includes our technically superior ATX-size motherboard, which features both SIMM and DIMM memory slots—one of the most asked-for features in the business. And they support both EDO and new SDRAM memory. The new optimized VIA VP2 chipset is the fastest yet—bursting hard disk transfers up to 33MB/sec! This new Ultra DMA/33 mode is easily 50% faster than the previous best. You simply can't find a better, more advanced motherboard. Get your hands on this Tiger/AMD powerhouse; you'll be glad you did. All systems include Tiger's full-year on-site warranty. What an extraordinary value!

Includes...

matrox

Mystique 220 Video!

PC Computing

September, 1997

"The Tiger GT offers high-end components and a brilliant display in a value-priced notebook... for pure price and features the Tiger GT is the King!"

COMPUTER SHOPPER

September, 1997

Hot Color! The 12.1" SGVA Dual Scan or Active Matrix display delivers crisp, brilliant 800 x 600 resolution. • 16MBor 32MB EDO RAM! Includes a 144-pin SO-DIMM socket... For Fast, Easy Do-It-Yourself Upgrades Up To 80MB! • Duracell-Compatible Battery. The modular NiMH battery pack is replaceable with any Duracell compatible pack! Built-in digital stereo speakers deliver exceptional 16-bit SoundBlaster compatible audio. Plus, two Type I, Type II or one Type III PCMCIA slots for expansion. Under 7 lbs!

FREE WordPerfect 8



*These notebooks come with a one year 72-hour factory repair/turnaround exchange warranty. We will gladly repair or replace defective unit, but will not accept returns. We do not offer price protection in the event prices rise or fall.

Item#	Processor	RAM/Exp. To	Hard Drive	CD-ROM	Screen	Price
A113-5010	Cyrix 6x86 PR166+	16MB/80MB	1.3GB	10X	12.1" Dual Scan	\$1,679.99
A113-5030	Intel Pentium 166MMX	16MB/80MB	1.6GB	10X	12.1" Active Matrix	\$2,229.99
A113-5040	Intel Pentium 200MMX	32MB/80MB	2.0 GB	10X	12.1" Active Matrix	\$2,779.99
A113-5050	Intel Pentium 233MMX	48MB/80MB	3.0 GB	10X	12.1" Active Matrix	\$3,579.99

VISIT WWW.TIGERDIRECT.COM FOR Instant Quotes On Any Computer System With Our ON-LINE CONFIGURATOR!

4GB HARD DRIVE

- CAPACITY—3.0 GB • INTERFACE—EIDE Mode 4
- SEEK TIME—14 msec • TRANSFER RATE—16.6 MB/S
- SPINDLE SPEED—4500 RPM • BUFFER—128KB
- BAY SIZE—3.5" • WARRANTY—3 years

ALSO AVAILABLE...

WESTERN DIGITAL KITS		MAXTOR KITS	
W10-1136	3.1 GB 229.99	M122-2000	2.1 GB 209.99*
W10-1138	4.0 GB 299.99*	M122-2004	3.5 GB 289.99*
W10-1140	5.1 GB 369.99*	M122-2008	7.0 GB 469.99*

*Price after \$30 mail-in rebate. Prices subject to change.

JTS CHAMPION INCREDIBLY PRICED! JUST...

\$199.99

A113-9050

TIGER PCs FROM JUST \$799.99

AMD-K6, Pentium II and 6x86... Tiger Builds Great Systems!

In a recent review of AMD-K6 PCs, here's what PC Mag had to say...

"The Tiger K6 233 was this roundup's leading performer..."
 "...its Business Winstone score led the pack."
 "...its MMX numbers were unmatched."



YAMAHA HIGH-FIDELITY SPEAKERS
On 233 Systems



1 YEAR ON-SITE WARRANTY



Monitor not included.

6x86™ PR200+ System	AMD-K6 233 MMX System	Pentium II 266 MMX System
- IBM 6x86 PR200+ Processor 16MB High-speed EDO RAM 1.3 GB EIDE Hard Disk - S3 VIRGE 64-Bit 3D PCI Video 2MB Video Memory 20X CD-ROM Drive 33.6K Faxmodem 16-Bit Multimedia Sound - Amplified Stereo Speakers - AT Motherboard with Case 1 Year On-Site Warranty	- AMD-K6 233MHz MMX Processor 32MB High-speed EDO RAM 3.0 GB EIDE Hard Disk - Matrox Mystique 220 3D Video 4MB Video Memory 20X CD-ROM Drive 33.6K Voice/Faxmodem (upgradable) 16-Bit Multimedia 3D Sound - Yamaha Amplified Stereo Speakers - ATX Motherboard with Case 1 Year On-Site Warranty	- Intel Pentium II 266 MMX Processor 32MB High-speed EDO RAM 3.0 GB EIDE Hard Disk - Matrox Mystique 220 3D Video 4MB Video Memory 20X CD-ROM Drive 33.6K Voice/Faxmodem (upgradable) 16-Bit Multimedia 3D Sound - Yamaha Stereo Speakers - ATX Motherboard with Case 1 Year On-Site Warranty
A113-1196B \$799.99	A113-1330B \$1,389.99	A113-1270 \$1,999.99

Turn Your PC Into A 200MHz Screamer With A New Case, Motherboard And CPU

Ready to upgrade your current system with a high-performance processor? Good decision... you've come to the right place. Tiger has today's hottest processors with state-of-the-art motherboards ready to install in your current case—or choose this super motherboard already installed in this roomy 9-bay case. Either way, this is the right way to go for the largest boost in performance possible for any computer system.

Easy? You Bet! Upgrading is easy. Whether you choose the Motherboard-Only or Motherboard And Case package, assembly takes less than an hour. We'll even show you how with our free, easy-to-follow booklet. Anyone can do it! For the motherboard upgrade, just pop the standard Baby-AT size motherboard into your existing Baby-AT case, add your hard drive, memory, video card, monitor, keyboard and mouse. That's all there is to it! We include our new picture-full booklet to show you how. This is the right way to upgrade an older computer to the power of today's hottest processor just like that!

These are all top quality components, built from the ground up with all the very latest in speed technology and Plug-and-Play simplicity. Is it difficult? Not anymore!



NOW JUST \$249.99

Here's What You Get In These Motherboard/Case Upgrades...

- Two 72-pin SIMM Sockets
- Two 168-pin DIMM Sockets
- Supports FP, EDO or SDRAM
- Supports up to 384MB RAM
- 512K Pipelined Burst L2 Cache
- Dual-channel EIDE Controller with up to 22 MB/sec. hard disk transfers with PIO 4 and 5
- Two 16550 Serial Ports
- ECP/EPP Parallel port
- PS/2 Mouse Port
- 5-Pin DIN Keyboard Port
- Infrared DB-9 connector
- Four 32-bit Master PCI slots
- Four 16-bit ISA slots
- Motherboard runs up to 75MHz—14% faster
- ZIF Socket 7 for CPU upgrades
- VIA Apollo chipset features Concurrent PCI
- Award BIOS features Automatic Hard Disk Detection, Automatic PCI Configuration, APN 1.2 Power Management, Password Control, Boot Virus Protection and more.
- Plug 'n Play compatible BIOS

Tiger Motherboards & Barebone Kits		
Item #	Description	Price Each
A113-8671B	Cyrix 6x86 PR200+ MotherBoard (Fits Baby-AT cases)	\$189.99
A113-8670B	Cyrix 6x86 PR200+ MotherBoard And Case	\$249.99

VISIT WWW.TIGERDIRECT.COM FOR Instant Quotes On Any Computer System With Our ON-LINE CONFIGURATOR!

MEMORY SALE!

SIMM: EDO OR FAST PAGE SAME PRICE

16MB \$59.99	32MB \$119.99
#P56-1007 FAST PAGE	#P56-1023 EDO
#P56-1009 FAST PAGE	#P56-1025 EDO

DIMM: SDRAM OR EDO SAME PRICE

16MB \$89.99	32MB \$179.99
EDO DIMMs—3.3v Burst-EDO Non Buffered 168-Pin. SDRAM DIMMs—3.3v 10ns (Up To 100 MHz) Non Buffered 168-Pin.	
#P56-1209 - 16 MB	#P56-1210 - 32 MB

Memory prices subject to change.

Abort, Retry, Fail?

Sartorial Splendor

Do you make or sell PC-themed clothing or jewelry? You know the stuff: earrings made out of Pentium chips, motherboard-printed scarves, joystick boxer shorts.

Send us a photo, catalog, or sample if you want to be included in the first-ever Abort, Retry, Fail? high-fashion spread. It's going to be absolutely fabulous.

Stop Me if You've Heard This One Before

Are you a well-connected e-mailer with lots of funny friends? Test your popularity by seeing how many of these rapidly spreading jokes and tricks you've already received:

- "A man and his wife tee off from the first hole at the golf course and break the window of a million-dollar home."
- "Add this number, subtract that number, pick a color.... It's a brown elephant from Denmark."
- "The President needs to figure out which is the best law enforcement agency: the CIA, the FBI, or the LAPD."

They replaced the French Provincial touch pad with a Danish Modern one. (Incredible Universe ad.)



This is what people mean when they say their printer is a pain in the rear. (Radio Shack ad.)



Yeah, it's a really nice city, although some people find it a bit damp. (The Raleigh News & Observer.)

More Daffy Documentation

We were amused to find these admonitions in Alchemy Mindworks' Graphic Workshop FAQ:

"No part of this document may be reproduced by any means without the written permission of Alchemy Mindworks Inc. No fur-bearing animals were harmed during the creation of this document. Allergy alert: may contain nutmeg, but we doubt it. Batteries are included. Good luck finding them."



"We've failed to meet our Oct. 31 launch date for **Treat** this year, but we're developing a new, more robust version that should be available by the first or second quarter of next year."

If your entry is used, we'll send you \$50 and a PC Magazine T-shirt. Send your entries to Abort, Retry, Fail?, PC Magazine, One Park Ave., New York, NY 10016-5802. Winners this issue: Anthony Edwards, Rick Kilton, Paul Munsen, and Branislav Shulman. Atlantis illustration courtesy of Chris Casady, tilenut@aol.com.

QUENCH YOUR THIRST FOR POWER WITHOUT DRAINING YOUR WALLET.

DELL® LATITUDE™ LM M166ST 166MHz PENTIUM® PROCESSOR WITH MMX™ TECHNOLOGY

- ★ 12.1" SVGA Active Matrix Display
- ★ 16MB EDO RAM (72MB Max)
- ★ 256KB L2 Pipeline Burst Cache
- ★ 1.5GB Hard Drive
- Options Bay accepts 20X Max™ Variable CD-ROM, 3.5" Floppy Drive (both included) or Optional 2nd Lithium Ion Battery
- ★ PCI Bus with 128-bit Graphics Accelerator with 64K Colors
- Integrated 16-bit Stereo Sound
- Smart Lithium Ion Battery
- ★ Microsoft® Office 97 Small Business Edition
- Microsoft® Windows® 95
- IrDA 1.0 Standard Compliant
- Touchpad/Under 7 Pounds*
- Extendable 1 Year Warranty†
- ★ Upgrade to 40MB EDO RAM, add \$299.
- ★ Upgrade to a 2.1GB Hard Drive, add \$149.
- ★ 2nd Lithium Ion Battery, add \$199.
- ★ NEW 56K Capable**x2 Modem, add \$149.

\$2899

Business Lease*: \$105/Mo.

Order Code #600140

DELL®

TO ORDER TOLL-FREE

800-395-3664

TO ORDER ONLINE

www.dell.com/buydell

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT
Sun 12pm-5pm CT In Canada: call 800-233-0702
GSA Contract #GS-35F-4076D

Keycode #04549

NOW GET THE AWARD-WINNING DELL LATITUDE LM M166ST NOTEBOOK FOR ONLY \$2899!

Sure. Power comes at a price. Fortunately, it's one you can afford. Because we've lowered the price on our award-winning, powerhouse notebook, the Latitude LM M166ST. You see, we started out with the 166MHz Intel® Mobile Pentium® processor with MMX™ technology with a 32KB internal cache. Then we added an improved 128-bit graphics accelerator for blazing fast video, 64K color depth and true multimedia functionality. The result? Well, *Windows Magazine* tested an LM M166ST configuration† and puts it subtly in their August '97 issue: "The fastest notebook we've ever tested with every option you could ever want." Not bad for a notebook line starting at under \$3000. And you get all this from the only notebook manufacturer to receive an "A" grade based on *PC Magazine's* July '97 Service and Reliability Readers' Survey results. So go ahead and give us a call. Because while the performance puts the LM M166ST over the top, the price brings it well within reach.



HOW MANY COMPANIES WILL LET YOU RETURN YOUR COMPUTER WHEN IT BECOMES OBSOLETE?



**INTRODUCING DELL'S PERSONAL LEASE WHICH PROTECTS YOU
AGAINST OBSOLESCENCE. CALL NOW FOR MORE DETAILS.**

NEW DELL DIMENSION® XPS D266

**266MHz PENTIUM® II PROCESSOR
FEATURING MMX® TECHNOLOGY**

- 32MB SDRAM Memory
- 512KB Integrated L2 Cache
- NEW 6.4GB Ultra ATA Hard Drive with 512KB Cache (9.5ms)
- 1000TX Trinitron® Monitor (15.9" v.i.s., .26dp.)
- NEW STB Velocity 4MB AGP Video Card*
- 24X Max⁵ Variable CD-ROM Drive
- Integrated Yamaha Wavetable Sound
- Altec Lansing ACS-90 Speakers
- 56K Capable** U.S. Robotics x2 WinModem
- Microsoft® Office 97 Small Business Edition plus Encarta 97
- MS Windows® 95/MS IntelliMouse
- 3 Year Limited Warranty† with 1 Year On-site^Δ Service

Personal Lease

\$119/Mo.^Δ

or buy today for \$2679

Order Code #500910

A little overwhelmed by the rate of technology change? Suffering from the "fear of computer commitment?" Well, you can breathe easier now. Because in addition to our business lease program, Dell is now offering computer leasing directly to consumers on all our Dell Dimension and Latitude LM systems. With an over-the-phone approval process that typically takes just minutes and low monthly payments, you can get the latest technology on your desk in a snap.

But here's a real advantage: At the end of the 24-month lease period, you can trade your system in and lease a new one!† This practically guarantees you'll never be stuck with obsolete technology again. And in the unlikely event you need service on your Dell Dimension system, it's covered by our service program for the entire lease term. Plus, as added flexibility, you have the option to buy your leased system outright at the end of the lease term, or even extend the plan for up to six months.† So call us now for more details.

^Δ Amount of monthly lease payment, based on 24-month lease from Dell Financial Services L.P., an independent entity; amount due prior to delivery: \$238 (amounts exclude taxes which may vary; for example, Hartford City, IN fees \$5.95); no security deposit required; subject to credit approval and availability. Lease terms subject to change. †Some conditions apply.

*Product, as configured, will ship by October 20. Please call for updated shipment information.



DELL®

TO ORDER TOLL-FREE

800-395-3664

TO ORDER ONLINE

www.dell.com/buydell

Mon-Fri 7am-9pm CT • Sat 10am-6pm CT
Sun 12pm-5pm CT In Canada, call 800-233-0702
GSA Contract #GS-35F-4076D

Keycode #04548